

Source: TSG CN WG 1

Title: CRs to R98 and R99 (with mirror CRs) on Work Item TEI towards 04.08, 24.008  
and 23.122 , - pack 1

Agenda item: 7.22

Document for: APPROVAL

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**Introduction:**

This document contains 11 CRs on **R98 and R99 (with mirror CRs)** Work Item "TEI", that have been agreed by **TSG CN WG1**, and are forwarded to TSG CN Plenary meeting #12 for approval.

Spec	CR	Rev	Doc-2nd-Level	Phase	Subject	Cat	Version-Current	Workitem
04.08	A1071	1	N1-010627	R98	Length of User-user IE	F	7.11.0	TEI
24.008	333	2	N1-010662	Rel-4	Length of User-user IE	A	4.2.0	TEI
24.008	332	2	N1-010663	R99	Length of User-user IE	F	3.7.0	TEI
24.008	420	1	N1-010859	R99	Handling of MM reject causes 2, 3 and 6 by mobile stations	F	3.7.0	TEI
24.008	421	1	N1-010860	Rel-4	Handling of MM reject causes 2, 3 and 6 by mobile stations	A	4.2.0	TEI
24.008	415	3	N1-010861	R99	Partial Roaming - restriction by location area	F	3.7.0	TEI
24.008	416	2	N1-010862	Rel-4	Partial Roaming - restriction by location area	A	4.2.0	TEI
24.008	417	2	N1-010916	R99	The priority in the CALL PROCEEDING message for eMLPP supporting network	F	3.7.0	TEI
24.008	418	2	N1-010917	Rel-4	The priority in the CALL PROCEEDING message for eMLPP supporting network	A	4.2.0	TEI
23.122	029	3	N1-010918	R99	Partial Roaming - restriction by location area	F	3.6.0	TEI
23.122	030	3	N1-010919	Rel-4	Partial Roaming - restriction by location area	A	4.0.0	TEI

## CHANGE REQUEST

⌘ **04.08 CR A1071** ⌘ rev **1** ⌘ Current version: **7.11.0** ⌘

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

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

**Title:** ⌘ Length of User-user IE

**Source:** ⌘ Siemens AG

**Work item code:** ⌘ TEI

**Date:** ⌘ 27.04.01

**Category:** ⌘ **F**

**Release:** ⌘ R98

Use one of the following categories:

- F** (essential 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:** ⌘

1) Internal inconsistency:

According to subclause 10.5.4.25, the user-user IE is a type 4 information element with a minimum length of 3 octets and a maximum length of either 35 or 131 octets. As in the User information message the user-user IE is included as a mandatory IE, the IEI is omitted (i.e. the format is LV) and the length must be in the range of 2-130 instead of 3-131. The wrong upper limit was introduced in R98 with CR 04.08-A495. The wrong lower limit was introduced somewhen at the beginning of GSM phase 2. (In GSM phase 1 the correct range of 2-130 was specified. Note also that in R98 for the other call control messages, in which the user-user IE is optional, the correct range of 3-131 has been specified.)

2) Interworking problems with ITU-T standard:

ITU-T standard Q.763, ISDN user part – formats and codes, also specifies a range of 2-130 octets for the user-to-user IE in the user-to-user information message, in which the IE is mandatory, and a range of 3-131 octets for other messages in which the IE is optional. If the 3GPP specification is not aligned with Q.763, the following interworking problems may occur:

- If the mobile stations includes a user-user IE with a length of 131 octets (i.e. length indicator + protocol discriminator + 129 octets UUI), this information cannot be transferred via ISUP to another MSC or towards the fixed network. Note that according to TS 22.087, only 128 octets of UUI are supported by the the user-user service. As for the interworking between different networks, TS 22.087 specifies that in case of interworking between a network supporting 128 octets and a network supporting 32 octets of UUI, the UUI shall be truncated to 32 octets, but no indication is given to the originating user. Nothing comparable has been specified for the case of interworking between 129 and 128 octets, and the reaction of a network receiving 129 octets is unpredictable. (Note that it is questionable whether the MSC can apply the error handling of clause 8 and

	<p>discard the last octet of UUI, as the length in subclause 9.3.31 actually corresponds to a UUI of 129 octets.)</p> <p>- According to Q.763 it is allowed to send a user-user IE consisting only of a protocol discriminator, but no UUI. Q.957, the stage 3 specification for DSS1 User-to-User Signalling, explicitly mentions that in case of an implicit activation of user-user service 1, the minimum length for the optional user-to-user IE is 3 octets (= IEI + length indicator + protocol indicator). If an MSC receives a User information message from the fixed network, containing a user-to-user IE of only 2 octets, then the MSC will not be able to deliver this message. Neither ITU nor 3GPP have specified what the MSC should do in this case.</p>
<b>Summary of change:</b> ⌘	<p>It is proposed to correct the maximum length of the User-user IE in the User information message from R98 onwards and the minimum length from R99 onwards.</p> <p>The interworking problem between a R98 or earlier mobile station and a R99 or later network is solved in the following way: In case of a UUI of zero octets the User information message will only be delivered to the MS, if the revision level of the mobile station indicates support of R99 or later versions of TS 24.008.</p>
<b>Consequences if not approved:</b> ⌘	<p>If a mobile station tries to transfer 129 octets of UUI with one User information message, the result is unpredictable. (The UUI may be truncated or discarded or even delivered to the remote party, if this happens to be a mobile station served by the same MSC.)</p>

<b>Clauses affected:</b> ⌘	9.3.31
<b>Other specs affected:</b> ⌘	<input type="checkbox"/> Other core specifications ⌘ <input type="checkbox"/> Test specifications <input type="checkbox"/> O&M Specifications
<b>Other comments:</b> ⌘	

**How to create CRs using this form:**

Comprehensive information and tips about how to create CRs can be found at: [http://www.3gpp.org/3G\\_Specs/CRs.htm](http://www.3gpp.org/3G_Specs/CRs.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.
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- 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.

### 9.3.31 User information

This message is sent by the mobile station to the network to transfer information to the remote user. This message is also sent by the network to the mobile station to deliver information transferred from the remote user. This message is used if the user-to-user transfer is part of an allowed information transfer as defined in GSM 04.10.

See table 9.78/GSM 04.08.

Message type: USER INFORMATION

Significance: access

Direction: both

**Table 9.78/GSM 04.08: USER INFORMATION message content**

IEI	Information element	Type / Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator 10.2	M	V	1/2
	Transaction identifier	Transaction identifier 10.3.2	M	V	1/2
	User Information message type	Message type 10.4	M	V	1
	User-user	User-user 10.5.4.25	M	LV	3-13+0
A0	More data	More data 10.5.4.19	O	T	1

#### 9.3.31.1 User-user

Some networks may only support a maximum length of 35 octets. Procedures for interworking are not currently defined and are for further study.

#### 9.3.31.2 More data

The information element is included by the sending user to indicate that another USER INFORMATION message pertaining to the same message block will follow.

**\*\*\*\*\* SECTION PROVIDED FOR INFORMATION ONLY \*\*\*\*\***

#### 10.5.4.25 User-user

The purpose of the user-user information element is to convey information between the mobile station and the remote ISDN user.

The user-user information element is coded as shown in figure 10.5.114/GSM 04.08 and table 10.5.131/ GSM 04.08. There are no restrictions on the content of the user-user information field.

The user-user is a type 4 information element with a minimum length of 3 octets and a maximum length of either 35 or 131 octets. In the SETUP message the user-user information element has a maximum size of 35 octets in a GSM PLMN. In the USER INFORMATION, ALERTING, CONNECT, DISCONNECT, PROGRESS, RELEASE and RELEASE COMPLETE messages the user-user information element has a maximum size of 131 octets in a

GSM PLMN.

In other networks than GSM PLMNs the maximum size of the user-user information element is 35 or 131 octets in the messages mentioned above. The evolution to a single maximum value is the long term objective; the exact maximum value is the subject of further study.

NOTE: The user-user information element is transported transparently through a GSM PLMN.

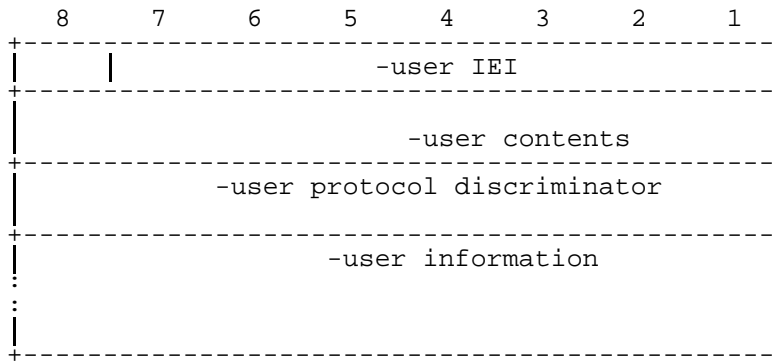


Figure 10.5.114/GSM 04.08: User-user information element

Table 10.5.131/GSM 04.08: User-user information element

-user protocol discriminator (octet 3)	
	convergence function
	messages -network call control
1 1 1	(Note 4)
1	
	including Rec.X.25 (Note 4)
	ation is structured according to user
	cifies the structure of X.25 call

## CHANGE REQUEST

⌘ 23.122 CR 29 ⌘ rev 3 ⌘ Current version: 3.6.0 ⌘

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

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

<b>Title:</b>	⌘ Partial Roaming – restriction by Location area		
<b>Source:</b>	⌘ Hutchison3g, Motorola		
<b>Work item code:</b>	⌘ TEI	<b>Date:</b>	⌘ 27-04-01
<b>Category:</b>	⌘ F	<b>Release:</b>	⌘ R99

Use one of the following categories:

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- R99 (Release 1999)
- REL-4 (Release 4)
- REL-5 (Release 5)

**Reason for change:** ⌘ Revision2

Moved proposed new section 4.4.6 instead to 4.5.5 - modification to the text to say during location registration rather than PLMN selection

Changed 'will' to 'shall' in new proposed section

Changed subclause to clause in section 5 table new note and in existing note

Revision 1

Changed new cause value name to 'No Suitable Cells In Location Area'

Added reference to 24.008 CR in cover sheet.

Moved paragraph added in section 3.1 and modified text.

Used 'shall' instead of 'will' in new section 4.4.6

Modified text in 4.4.6 and Section 5 table to say 'same PLMN'

Added change to section 3 figure.

Table 5 note modified text

Revision 0

This was recognised as a potential problem in the UE Idle Mode Workshop in Helsinki earlier this year, but no changes have yet been proposed as companies have concentrated on other issues related to roaming, namely Equivalent PLMN codes and Idle Mode search procedures, which themselves were key changes to enable roaming in a 2G/3G environment.

This change reflects the agreement reached in the CN1/SA1 Network Selection Joint Ad

	Hoc meeting held on 8 <sup>th</sup> May 2001 in Helsinki.
	Partial roaming occurs when a mobile has access to a PLMN, but only to a limited set of location areas.
<b>Summary of change:</b>	⌘ The addition of 'No Suitable Cells In Location Area' and subsequent actions are added to Location Update Reject possibilities.
<b>Consequences if not approved:</b>	⌘ National and international roaming will not operate correctly when an operator uses a single PLMN code for both parts of network and partial or restricted roaming agreements are in place.

<b>Clauses affected:</b>	⌘ 3.1, 4.3.3, new section 4.4.6, 5									
<b>Other specs affected:</b>	<table border="0"> <tr> <td>⌘ <input checked="" type="checkbox"/></td> <td>Other core specifications</td> <td>⌘ 24.008</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Test specifications</td> <td></td> </tr> <tr> <td><input type="checkbox"/></td> <td>O&amp;M Specifications</td> <td></td> </tr> </table>	⌘ <input checked="" type="checkbox"/>	Other core specifications	⌘ 24.008	<input type="checkbox"/>	Test specifications		<input type="checkbox"/>	O&M Specifications	
⌘ <input checked="" type="checkbox"/>	Other core specifications	⌘ 24.008								
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<b>Other comments:</b>	⌘									

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## 3 Requirements and technical solutions

The following subclauses list the main requirements of idle mode operation and give an outline of the technical solution.

### 3.1 PLMN selection and roaming

The MS normally operates on its home PLMN (HPLMN). However a visited PLMN (VPLMN) may be selected, e.g., if the MS loses coverage. There are two modes for PLMN selection:

- i) Automatic mode - This mode utilizes a list of PLMNs in priority order. The highest priority PLMN which is available and allowable is selected.
- ii) Manual mode - Here the MS indicates to the user which PLMNs are available. Only when the user makes a manual selection does the MS try to obtain normal service on the VPLMN.

There are two cases:

- International Roaming - This is where the MS receives service on a PLMN of a different country than that of the HPLMN.
- National Roaming - This is where the MS receives service from a PLMN of the same country as that of the HPLMN, either anywhere or on a regional basis. The MS makes a periodic search for the HPLMN while national roaming.

To prevent repeated attempts to have roaming service on a not allowed LA, when the MS is informed that an LA is forbidden, the LA is added to a list of "forbidden LAs for roaming" which is stored in the MS. This list is deleted when the MS is switched off or when the SIM is removed. Such area restrictions are always valid for complete location areas independent of possible subdivision into GPRS routing areas. The structure of the routing area identifier (3GPP TS 23.003) supports area restriction on LA basis.

If a "No Suitable Cells In Location Area" message is received by an MS, that location area is added to the list of "forbidden LAs for roaming" which is stored in the MS. The MS shall then search for a suitable cell in the same PLMN but belonging to an LA which is not in the "forbidden LAs for roaming" list.

If a "PLMN not allowed" message is received by an MS in response to an LR request from a VPLMN, that VPLMN is added to a list of "forbidden PLMNs" in the SIM and thereafter that VPLMN will not be accessed by the MS when in automatic mode. A PLMN is removed from the "forbidden" list if, after a subsequent manual selection of that PLMN, there is a successful LR. This list is retained when the MS is switched off or the SIM is removed. The HPLMN shall not be stored on the list of "forbidden PLMNs".

In A/Gb mode, an ME not supporting SoLSA may consider a cell with the escape PLMN code (see 3GPP TS 23.073) to be a part of a PLMN belonging to the list of "forbidden PLMNs".

Optionally the ME may store in its memory an extension of the forbidden PLMN list. The contents of the extension of the list shall be deleted when the MS is switched off or the SIM is removed.

If a "GPRS services not allowed in this PLMN" message is received by an MS in response to an GPRS attach, GPRS detach or routing area update request from a VPLMN, that VPLMN is added to a list of "forbidden PLMNs for GPRS service" which is stored in the MS and thereafter that VPLMN will not be accessed by the MS for GPRS service when in automatic mode. This list is deleted when the MS is switched off or when the SIM is removed. A PLMN is removed from the list of "forbidden PLMNs for GPRS service" if, after a subsequent manual selection of that PLMN, there is a successful GPRS attach. The maximum number of possible entries in this list is implementation dependant, but must be at least one entry. The HPLMN shall not be stored on the list of "forbidden PLMNs for GPRS service".



### 4.3.3 List of states for location registration (figure 4)

The states are entered depending on responses to location registration (LR) requests. Independent update states exist for GPRS and for non-GPRS operation in MSs capable of GPRS and non-GPRS services.

- L1 Updated - The MS enters this state if an LR request is accepted. The update status is set to "updated". The GPRS and the non-GPRS update state of a MS may enter "updated" as a result of combined signalling or as a result of individual signalling depending on the capabilities of the network.
- L2 Idle, No IMSI - The MS enters this state if an LR request is rejected with cause:
- a) IMSI unknown in HLR;
  - b) illegal ME;
  - c) illegal MS;
  - d) GPRS services and non-GPRS services not allowed;
- or if there is no SIM. All update states of a MS enter this state regardless whether received by individual or combined signalling for events b) and c). Event a) has no influence on the GPRS update state. Events b), c) and d) results in "Roaming not allowed" for the GPRS update state.
- If a SIM is present, the non-GPRS update status of the SIM is set to "Roaming not allowed".
- L3 Roaming not allowed - The MS enters this state if it receives an LU reject message with the cause:
- a) PLMN not allowed;
  - b) Location area not allowed;
  - c) Roaming not allowed in this location area.
  - d) ~~\_\_\_\_\_d) GPRS services not allowed in this PLMN~~
  - e) No Suitable Cells In Location Area'
- Exept from event d) all update states of the MS are set to "Roaming not allowed" regardless whether received by individual or combined signalling. Event d) results in "Roaming not allowed" for the GPRS update state only. Event d) has no influence on the non-GPRS update state. The behaviour of the MS in the roaming not allowed state is dependent on the LR reject cause as shown in table 2 in clause 5. Additionally:
- in automatic mode, "PLMN not allowed" and "roaming not allowed in this location area" cause the Automatic Network Selection procedure of subclause 4.4.3.1.1 to be started; it is also caused by "GPRS services not allowed in this PLMN" when received by a GPRS MS operating in MS operation mode C;
  - in manual mode, "PLMN not allowed" and "roaming not allowed" cause the Manual Network Selection procedure of subclause 4.4.3.1.2 to be started; it is also caused by "GPRS services not allowed in this PLMN" when received by a GPRS MS operating in MS operation mode C.
- L4 Not updated - The MS enters this state if any LR failure not specified for states L2 or L3 occurs, in which cases the MS is not certain whether or not the network has received and accepted the LR attempt. The non-GPRS update status on the SIM and/or the GPRS update status are set to "not updated" depending on the specific location registration procedure and their outcome.

NOTE This clause does not describe all the cases. For more details refer to 3GPP TS 24.008 [23]

## 4.5.5 No Suitable Cells In Location Area

If during location registration the LR response " No Suitable Cells In Location Area" is received:

The MS shall attempt to find another LA of -the same PLMN on which it received the LR response. If the MS is able to find another LA it- shall attempt registration. If the MS is unable to find an LA the PLMN Automatic or Manual Mode Selection Procedure of clause 4.4.3.1- shall be followed, depending on whether the MS is in automatic or manual mode.

## 5 Tables and Figures

**Table 1: Effect of LR Outcomes on PLMN Registration**

Location Registration Task State	Registration Status	Registered PLMN is
Updated	Successful	Indicated in the stored registration area identity
Idle, No IMSI	Unsuccessful	No registered PLMN (3)
Roaming not allowed:		
a) PLMN not allowed	Unsuccessful	No registered PLMN
b) LA not allowed	Indeterminate(1)	No registered PLMN
c) Roaming not allowed in this LA	Indeterminate (2)	No registered PLMN
d) <u>No Suitable Cells In Location Area</u>	<u>Indeterminate (4)</u>	<u>No registered PLMN</u>
Not updated	Unsuccessful	No registered PLMN

- 1 The MS will eventually either enter a different state when the registration status will be determined, or fail to be able to camp on a cell, when registration will be unsuccessful.
- 2 The MS will select the HPLMN if in automatic mode and will enter Automatic Network Selection Mode Procedure of ~~sub~~clause 4.4.3.1. If in manual mode, the MS will display the list of available PLMNs and follow the Manual Network Selection Mode Procedure of ~~sub~~clause 4.4.3.1.2 If the appropriate process does not result in registration, the MS will eventually enter the limited service state.
- 3 A MS may have different update states for GPRS and non-GPRS. A PLMN is registered when at least one of both update states is updated.
- 4 The MS will attempt registration on another LA of the same PLMN if one is available otherwise it will enter either the Automatic Network Selection Mode procedure of clause 4.4.3.1 or follow the Manual Network Selection Mode procedure of clause 4.4.3.1.2. If the appropriate process does not result in registration, the MS will eventually enter the limited service state.

NOTE 1: MSs capable of GPRS and non-GPRS services may have different registration status for GPRS and for non-GPRS.

NOTE 2: The registered PLMN is determined by looking at the stored registration area identity and stored location registration status.

**Table 2: LR Process States and Allowed Actions**

Location registration task state	New LR request when				Normal Calls Supported (1)	Paging responded to
	Changing Cell	Changing registration area	Changing PLMN	Other		
Null (4)	No	Yes	Yes	No	No	No
Updated, (5)	No	Yes	Yes	(2)	Yes	Yes
Idle, No IMSI (7)	No	No	No	No	No	No
Roaming not allowed:						
a) Idle, PLMN not allowed	No	No	Yes	No	No	Optional if with IMSI
b) Idle, LA not allowed	No	Yes(6)	Yes	No	No	Optional if with IMSI
c) Idle, Roaming not allowed in this LA	No	Yes(6)	Yes	No	No	Optional if with IMSI
d) <u>No Suitable Cells In Location Area</u>	<u>No</u>	<u>Yes(6)</u>	<u>Yes</u>	<u>No</u>	<u>No</u>	<u>Optional if with IMSI</u>
Not updated	Yes	Yes	Yes	(2)&(3)	(3)	Yes if with IMSI
1): Emergency calls may always be made, subject to access control permitting it. 2): A new LR is made when the periodic registration timer expires. 3): If a normal call request is made, an LR request is made. If successful the updated state is entered and the call may be made. 4): The MS is in the null state from switch on until it has camped on a cell and either made an LR attempt or decided that no LR attempt is needed. 5): In this state, IMSI detach is performed if the MS is deactivated and the BCCH indicates that IMSI attach/detach shall be used. An LR request indicating IMSI attach is performed if the MS is activated in the same registration area in which it was deactivated while being in this state. 6): A GPRS MS shall not perform a new LR when the new routing area is part of a LA contained in a list of forbidden LA. 7): The GPRS registration status "Idle, no IMSI" is entered when LR is rejected with cause "GPRS not allowed". The non-GPRS registration status „Idle, no IMSI“ is entered when the cause "IMSI unknown in HLR" is received.						

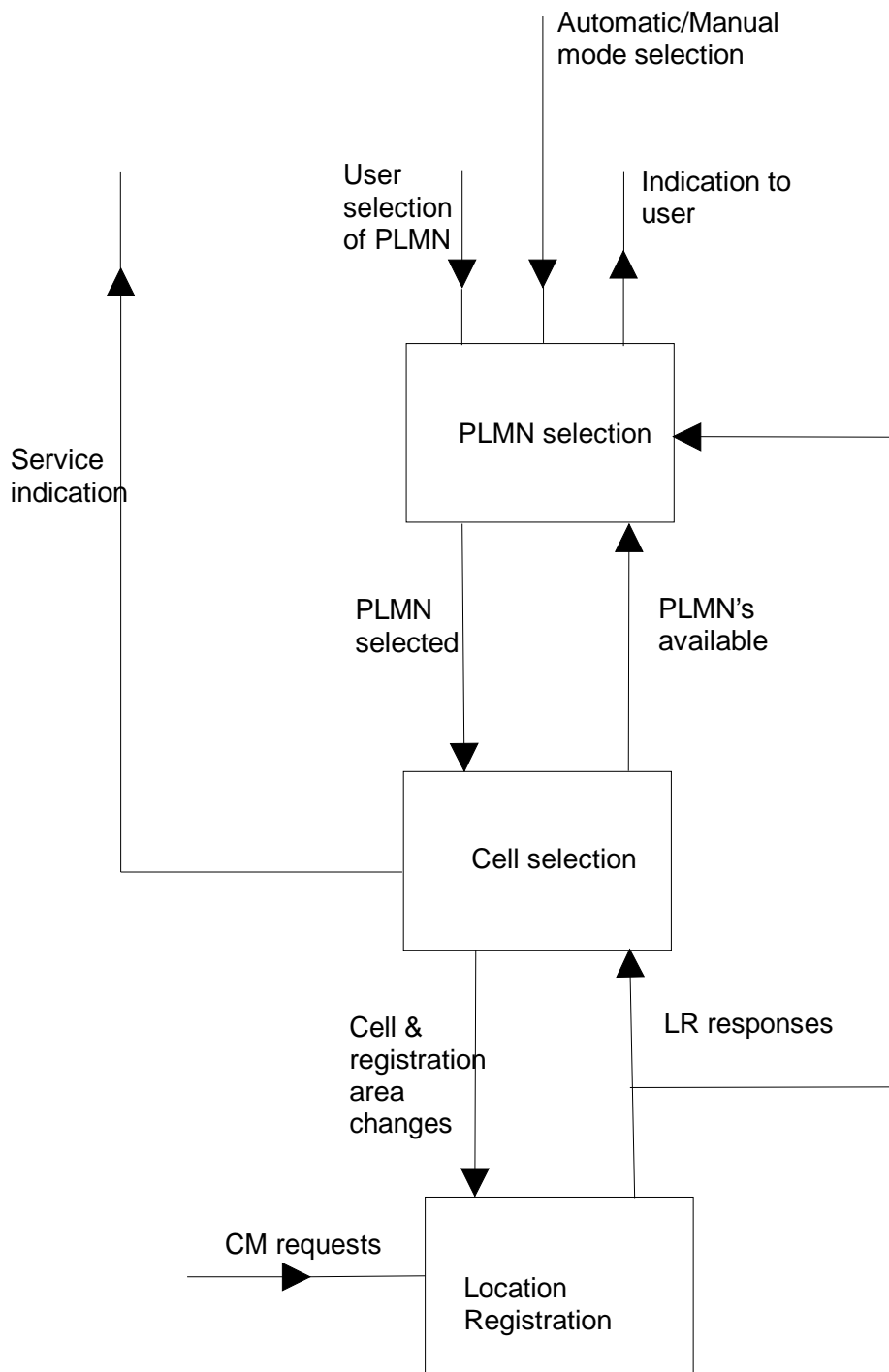
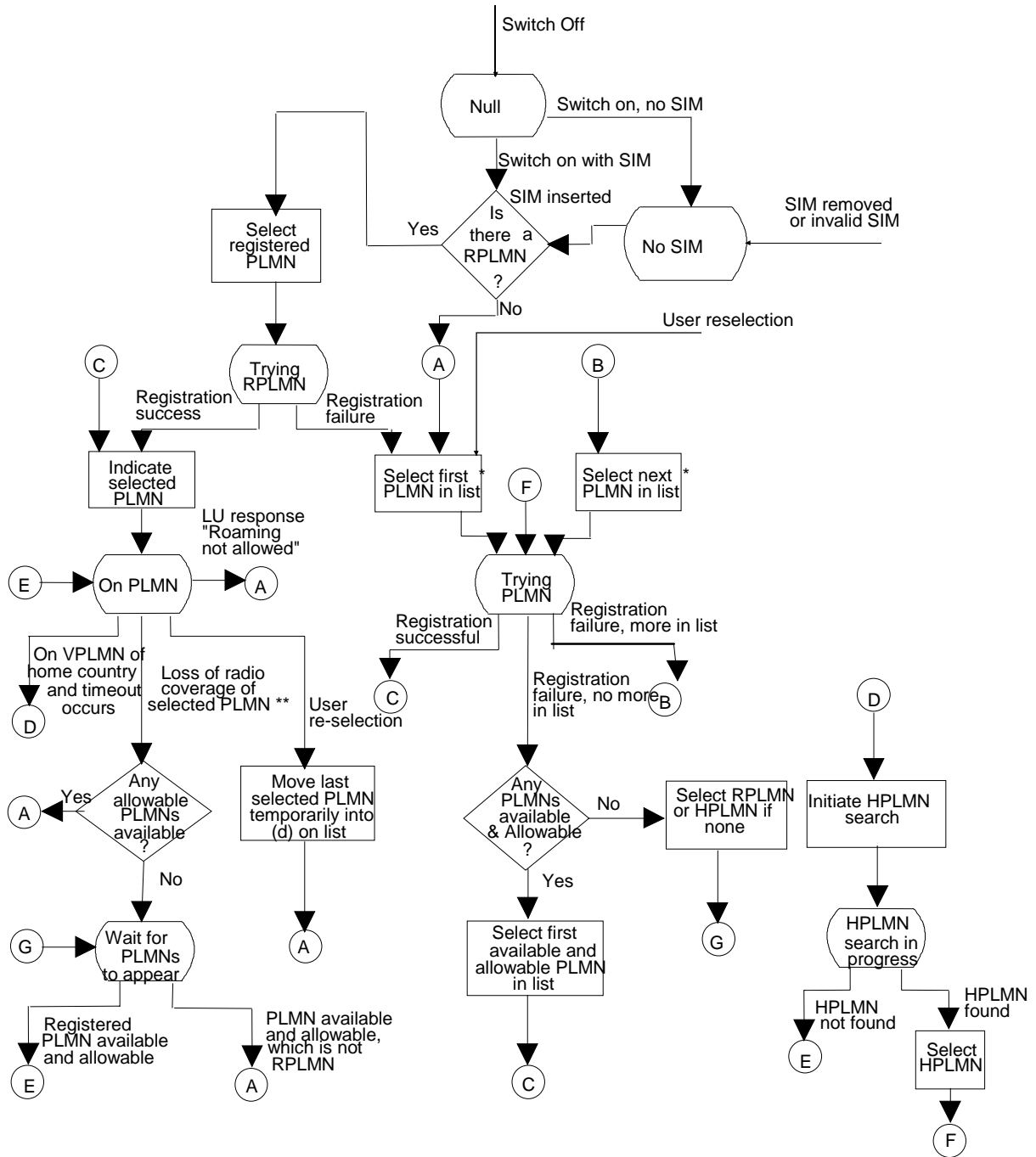


Figure 1: Overall Idle Mode process



\* "List" consists of points i) to v) as defined in section 4.4.3.1.1 except in case of a user re-selection in which case "list" consists of points i) to vi) as defined in section 4.4.3.2.1

\*\* Includes effective loss of coverage due to LAs being forbidden in all potentially suitable cells

Figure 2a: PLMN Selection State diagram (automatic mode)

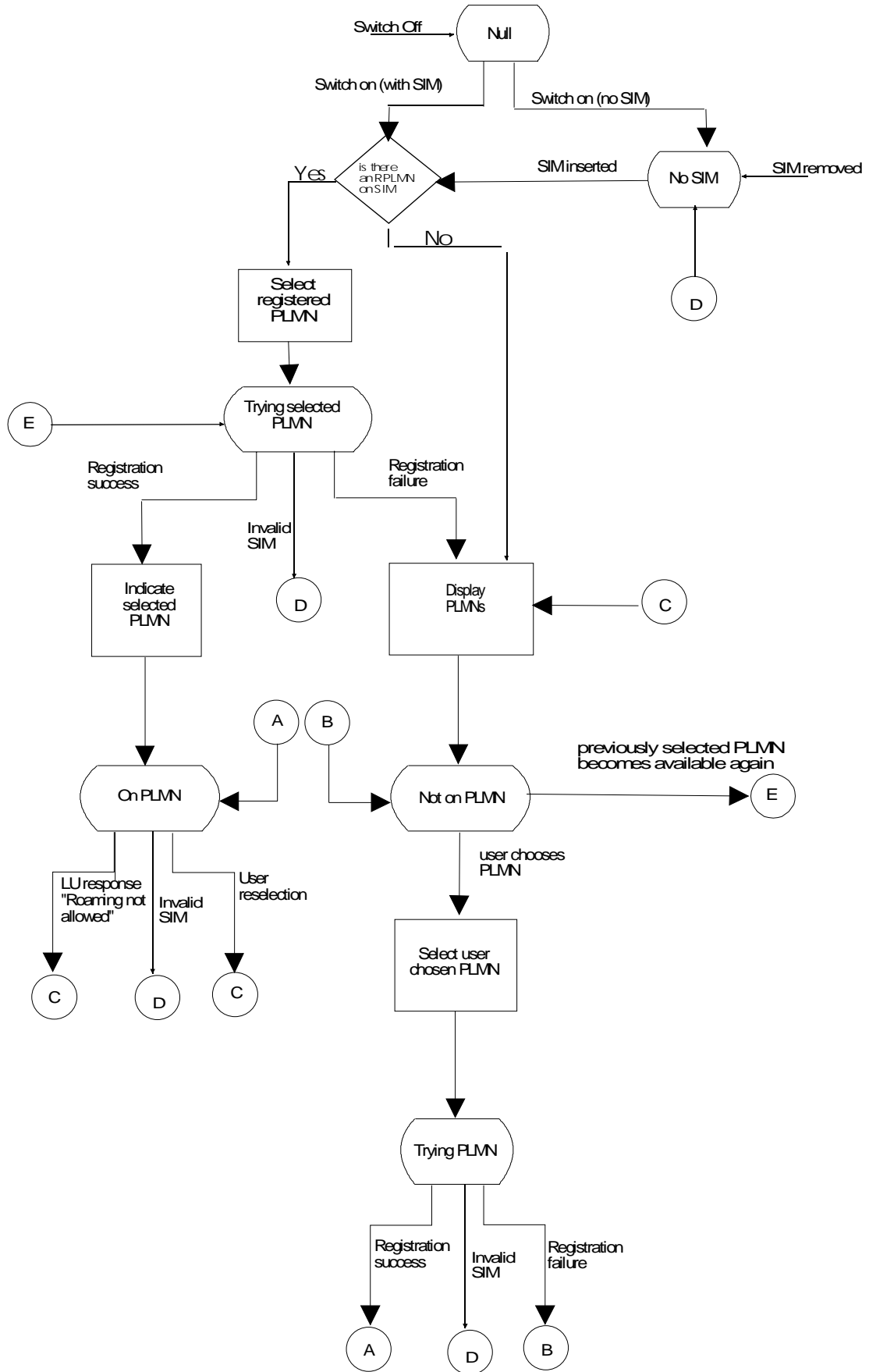
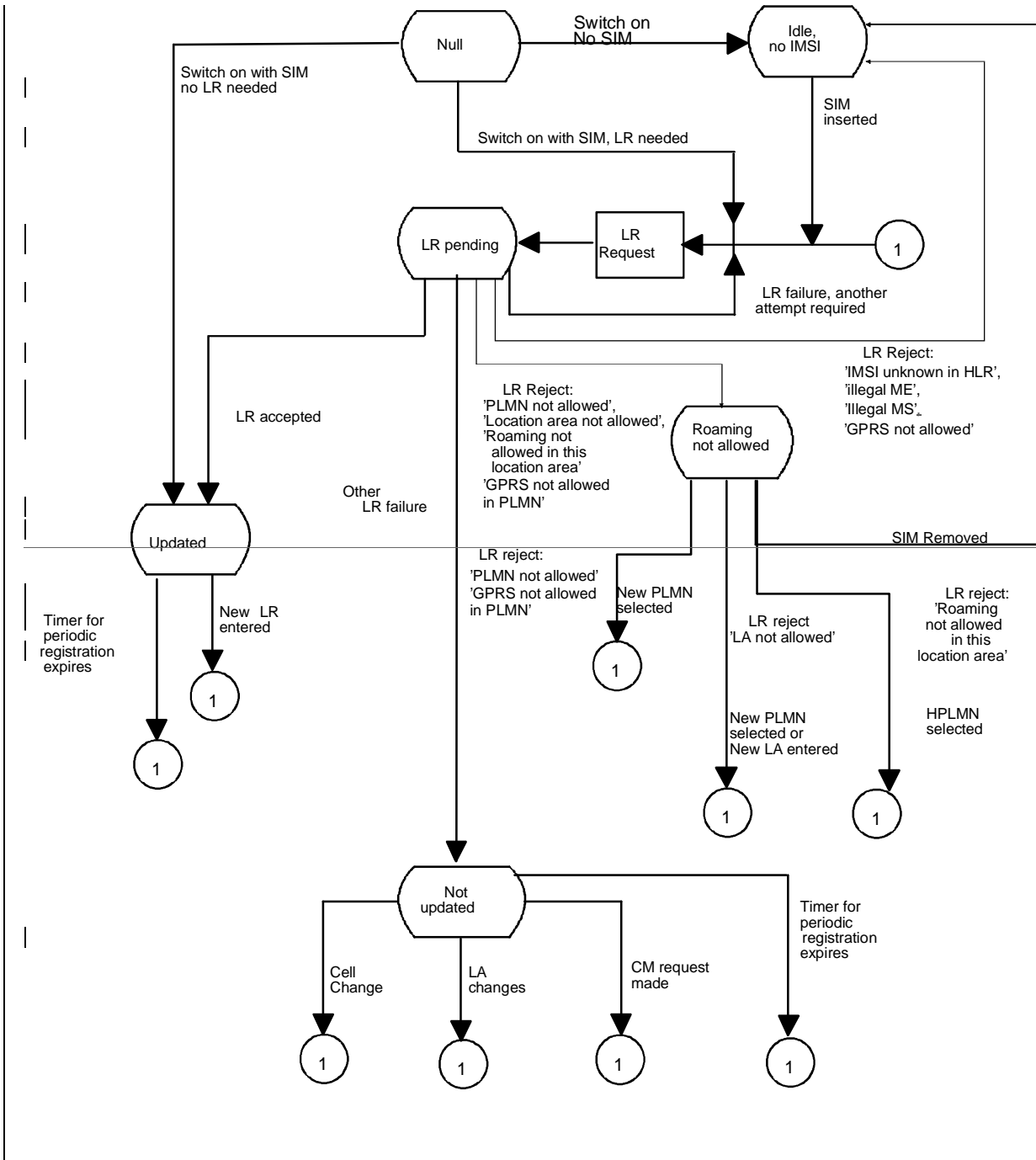
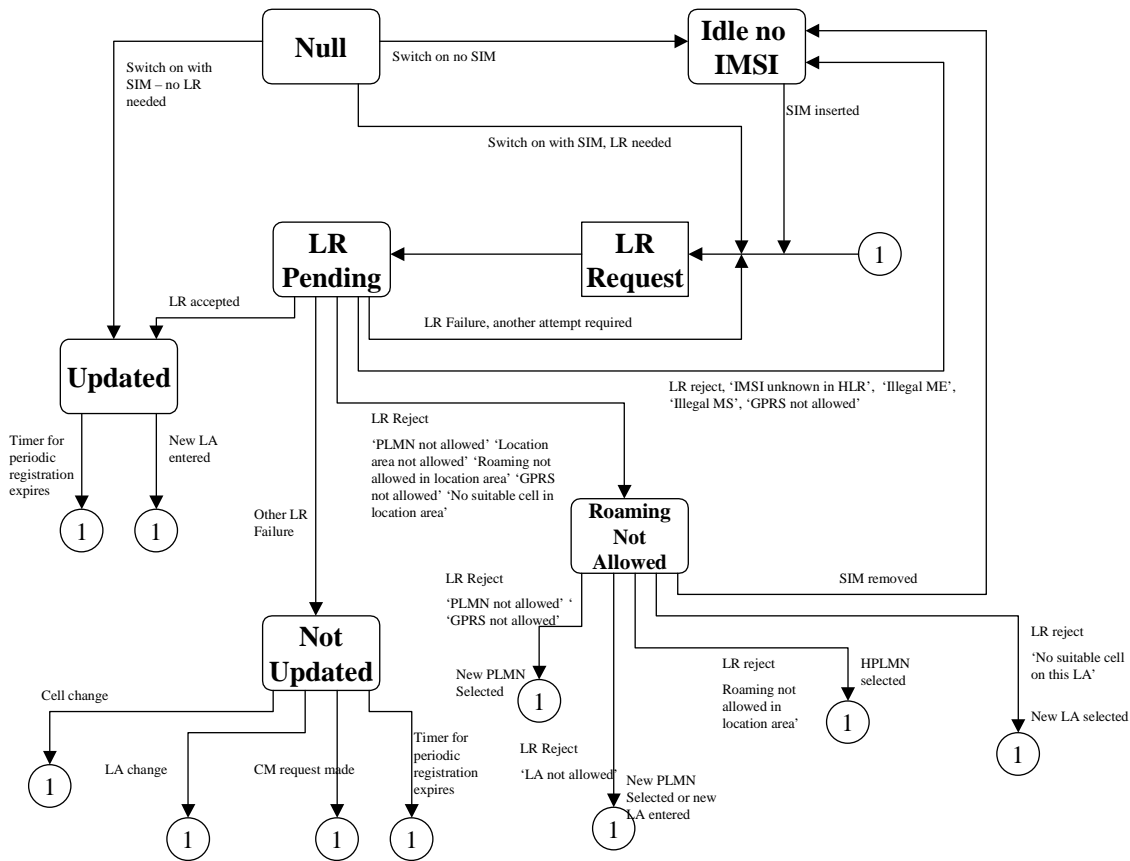


Figure 2b: PLMN Selection State diagram (manual mode)







NOTE 1: Whenever the MS goes to connected mode and then returns to idle mode again the MS selects appropriate state.

NOTE 2: A MS capable of GPRS and non-GPRS services has two Task State machines one for GPRS and one for non-GPRS operation.

Figure 3: Location Registration Task State diagram

## CHANGE REQUEST

⌘ **23.122 CR 30** ⌘ rev **3** ⌘ Current version: **4.0.0** ⌘

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

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

**Title:** ⌘ Partial Roaming – restriction by location area

**Source:** ⌘ Hutchison3g, Motorola

**Work item code:** ⌘ TEI

**Date:** ⌘ 27-04-01

**Category:** ⌘ **A**

**Release:** ⌘ REL-4

Use one of the following categories:

**F** (essential correction)

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**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:** ⌘ Revision2

Moved proposed new section 4.4.6 instead to 4.5.5 - modification to the text to say during location registration rather than PLMN selection

Changed 'will' to 'shall' in new proposed section

Changed subclause to clause in section 5 table new note and in existing note

Revision 1

Changed new cause value name to 'No Suitable Cells In Location Area'

Added reference to 24.008 CR in cover sheet.

Moved paragraph added in section 3.1 and modified text.

Used 'shall' instead of 'will' in new section 4.4.6

Modified text in 4.4.6 and Section 5 table to say 'same PLMN'

Added change to section 3 figure.

Table 5 note modified text

Revision 0

This was recognised as a potential problem in the UE Idle Mode Workshop in Helsinki earlier this year, but no changes have yet been proposed as companies have concentrated on other issues related to roaming, namely Equivalent PLMN codes and Idle Mode search procedures, which themselves were key changes to enable roaming in a 2G/3G environment.

This change reflects the agreement reached in the CN1/SA1 Network Selection Joint Ad

	Hoc meeting held on 8 <sup>th</sup> May 2001 in Helsinki.
	Partial roaming occurs when a mobile has access to a PLMN, but only to a limited set of location areas.
<b>Summary of change:</b>	⌘ The addition of 'No Suitable Cells In Location Area' and subsequent actions are added to Location Update Reject possibilities.
<b>Consequences if not approved:</b>	⌘ National and international roaming will not operate correctly when an operator uses a single PLMN code for both parts of network and partial or restricted roaming agreements are in place.

<b>Clauses affected:</b>	⌘ 3.1, 4.3.3, new section 4.4.6, 5									
<b>Other specs affected:</b>	<table border="0"> <tr> <td>⌘ <input checked="" type="checkbox"/></td> <td>Other core specifications</td> <td>⌘ 24.008</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Test specifications</td> <td></td> </tr> <tr> <td><input type="checkbox"/></td> <td>O&amp;M Specifications</td> <td></td> </tr> </table>	⌘ <input checked="" type="checkbox"/>	Other core specifications	⌘ 24.008	<input type="checkbox"/>	Test specifications		<input type="checkbox"/>	O&M Specifications	
⌘ <input checked="" type="checkbox"/>	Other core specifications	⌘ 24.008								
<input type="checkbox"/>	Test specifications									
<input type="checkbox"/>	O&M Specifications									
<b>Other comments:</b>	⌘									

#### How to create CRs using this form:

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- 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

## 3 Requirements and technical solutions

The following subclauses list the main requirements of idle mode operation and give an outline of the technical solution.

### 3.1 PLMN selection and roaming

The MS normally operates on its home PLMN (HPLMN). However a visited PLMN (VPLMN) may be selected, e.g., if the MS loses coverage. There are two modes for PLMN selection:

- i) Automatic mode - This mode utilizes a list of PLMNs in priority order. The highest priority PLMN which is available and allowable is selected.
- ii) Manual mode - Here the MS indicates to the user which PLMNs are available. Only when the user makes a manual selection does the MS try to obtain normal service on the VPLMN.

There are two cases:

- International Roaming - This is where the MS receives service on a PLMN of a different country than that of the HPLMN.
- National Roaming - This is where the MS receives service from a PLMN of the same country as that of the HPLMN, either anywhere or on a regional basis. The MS makes a periodic search for the HPLMN while national roaming.

To prevent repeated attempts to have roaming service on a not allowed LA, when the MS is informed that an LA is forbidden, the LA is added to a list of "forbidden LAs for roaming" which is stored in the MS. This list is deleted when the MS is switched off or when the SIM is removed. Such area restrictions are always valid for complete location areas independent of possible subdivision into GPRS routing areas. The structure of the routing area identifier (3GPP TS 23.003) supports area restriction on LA basis.

If a "No Suitable Cells In Location Area" message is received by an MS, that location area is added to a list of "forbidden location areas for roaming" which is stored in the MS. The MS shall then search for a suitable cell in the same PLMN but belonging to an LA which is not in the "forbidden LAs for roaming" list.

If a "PLMN not allowed" message is received by an MS in response to an LR request from a VPLMN, that VPLMN is added to a list of "forbidden PLMNs" in the SIM and thereafter that VPLMN will not be accessed by the MS when in automatic mode. A PLMN is removed from the "forbidden" list if, after a subsequent manual selection of that PLMN, there is a successful LR. This list is retained when the MS is switched off or the SIM is removed. The HPLMN shall not be stored on the list of "forbidden PLMNs".

In A/Gb mode, an ME not supporting SoLSA may consider a cell with the escape PLMN code (see 3GPP TS 23.073) to be a part of a PLMN belonging to the list of "forbidden PLMNs".

Optionally the ME may store in its memory an extension of the forbidden PLMN list. The contents of the extension of the list shall be deleted when the MS is switched off or the SIM is removed.

If a "GPRS services not allowed in this PLMN" message is received by an MS in response to an GPRS attach, GPRS detach or routing area update request from a VPLMN, that VPLMN is added to a list of "forbidden PLMNs for GPRS service" which is stored in the MS and thereafter that VPLMN will not be accessed by the MS for GPRS service when in automatic mode. This list is deleted when the MS is switched off or when the SIM is removed. A PLMN is removed from the list of "forbidden PLMNs for GPRS service" if, after a subsequent manual selection of that PLMN, there is a successful GPRS attach. The maximum number of possible entries in this list is implementation dependant, but must be at least one entry. The HPLMN shall not be stored on the list of "forbidden PLMNs for GPRS service".

### 4.3.3 List of states for location registration (figure 4)

The states are entered depending on responses to location registration (LR) requests. Independent update states exist for GPRS and for non-GPRS operation in MSs capable of GPRS and non-GPRS services.

- L1 Updated - The MS enters this state if an LR request is accepted. The update status is set to "updated". The GPRS and the non-GPRS update state of a MS may enter "updated" as a result of combined signalling or as a result of individual signalling depending on the capabilities of the network.
- L2 Idle, No IMSI - The MS enters this state if an LR request is rejected with cause:
- a) IMSI unknown in HLR;
  - b) illegal ME;
  - c) illegal MS;
  - d) GPRS services and non-GPRS services not allowed;
- or if there is no SIM. All update states of a MS enter this state regardless whether received by individual or combined signalling for events b) and c). Event a) has no influence on the GPRS update state. Events b), c) and d) results in "Roaming not allowed" for the GPRS update state.
- If a SIM is present, the non-GPRS update status of the SIM is set to "Roaming not allowed".
- L3 Roaming not allowed - The MS enters this state if it receives an LU reject message with the cause:
- a) PLMN not allowed;
  - b) Location area not allowed;
  - c) Roaming not allowed in this location area.
  - d) ~~⊕~~ GPRS services not allowed in this PLMN.
  - e) No Suitable Cells In Location Area
- Exept from event d) all update states of the MS are set to "Roaming not allowed" regardless whether received by individual or combined signalling. Event d) results in "Roaming not allowed" for the GPRS update state only. Event d) has no influence on the non-GPRS update state. The behaviour of the MS in the roaming not allowed state is dependent on the LR reject cause as shown in table 2 in clause 5. Additionally:
- in automatic mode, "PLMN not allowed" and "roaming not allowed in this location area" cause the Automatic Network Selection procedure of subclause 4.4.3.1.1 to be started; it is also caused by "GPRS services not allowed in this PLMN" when received by a GPRS MS operating in MS operation mode C;
  - in manual mode, "PLMN not allowed" and "roaming not allowed" cause the Manual Network Selection procedure of subclause 4.4.3.1.2 to be started; it is also caused by "GPRS services not allowed in this PLMN" when received by a GPRS MS operating in MS operation mode C.
- L4 Not updated - The MS enters this state if any LR failure not specified for states L2 or L3 occurs, in which cases the MS is not certain whether or not the network has received and accepted the LR attempt. The non-GPRS update status on the SIM and/or the GPRS update status are set to "not updated" depending on the specific location registration procedure and their outcome.

NOTE This clause does not describe all the cases. For more details refer to 3GPP TS 24.008 [23]

## 4.5.5 No Suitable Cells In Location Area

If during location registration the LR response " No Suitable Cells In Location Area " is received:

The MS shall attempt to find another LA of the same PLMN on which it received the LR response. If the MS is able to find another LA it shall attempt registration. If the MS is unable to find an LA the PLMN Automatic or Manual Mode Selection Procedure of clause 4.4.3.1 shall be followed, depending on whether the MS is in automatic or manual mode.

## 5 Tables and Figures

**Table 1: Effect of LR Outcomes on PLMN Registration**

Location Registration Task State	Registration Status	Registered PLMN is
Updated	Successful	Indicated in the stored registration area identity
Idle, No IMSI	Unsuccessful	No registered PLMN (3)
Roaming not allowed:		
a) PLMN not allowed	Unsuccessful	No registered PLMN
b) LA not allowed	Indeterminate(1)	No registered PLMN
c) Roaming not allowed in this LA	Indeterminate (2)	No registered PLMN
d) <u>No Suitable Cells In Location Area</u>	<u>Indeterminate (4)</u>	<u>No registered PLMN</u>
Not updated	Unsuccessful	No registered PLMN

- 1) The MS will eventually either enter a different state when the registration status will be determined, or fail to be able to camp on a cell, when registration will be unsuccessful.
- 2) The MS will select the HPLMN if in automatic mode and will enter Automatic Network Selection Mode Procedure of ~~sub~~clause 4.4.3.1. If in manual mode, the MS will display the list of available PLMNs and follow the Manual Network Selection Mode Procedure of ~~sub~~clause 4.4.3.1.2 If the appropriate process does not result in registration, the MS will eventually enter the limited service state.
- 3) ~~3)~~ A MS may have different update states for GPRS and non-GPRS. A PLMN is registered when at least one of both update states is updated.
- 4) The MS will attempt registration on another LA of the same PLMN if one is available otherwise it will enter either the Automatic Network Selection Mode procedure of clause 4.4.3.1 or follow the Manual Network Selection Mode procedure of clause 4.4.3.1.2. If the appropriate process does not result in registration, the MS will eventually enter the limited service state.

NOTE 1: MSs capable of GPRS and non-GPRS services may have different registration status for GPRS and for non-GPRS.

NOTE 2: The registered PLMN is determined by looking at the stored registration area identity and stored location registration status.

**Table 2: LR Process States and Allowed Actions**

Location registration task state	New LR request when				Normal Calls Supported (1)	Paging responded to
	Changing Cell	Changing registration area	Changing PLMN	Other		
Null (4)	No	Yes	Yes	No	No	No
Updated, (5)	No	Yes	Yes	(2)	Yes	Yes
Idle, No IMSI (7)	No	No	No	No	No	No
Roaming not allowed:						
a) Idle, PLMN not allowed	No	No	Yes	No	No	Optional if with IMSI
b) Idle, LA not allowed	No	Yes(6)	Yes	No	No	Optional if with IMSI
c) Idle, Roaming not allowed in this LA	No	Yes(6)	Yes	No	No	Optional if with IMSI
d) <u>No Suitable Cells In Location Area</u>	<u>No</u>	<u>Yes(6)</u>	<u>Yes</u>	<u>No</u>	<u>No</u>	<u>Optional if with IMSI</u>
Not updated	Yes	Yes	Yes	(2)&(3)	(3)	Yes if with IMSI
1): Emergency calls may always be made, subject to access control permitting it. 2): A new LR is made when the periodic registration timer expires. 3): If a normal call request is made, an LR request is made. If successful the updated state is entered and the call may be made. 4): The MS is in the null state from switch on until it has camped on a cell and either made an LR attempt or decided that no LR attempt is needed. 5): In this state, IMSI detach is performed if the MS is deactivated and the BCCH indicates that IMSI attach/detach shall be used. An LR request indicating IMSI attach is performed if the MS is activated in the same registration area in which it was deactivated while being in this state. 6): A GPRS MS shall not perform a new LR when the new routing area is part of a LA contained in a list of forbidden LA. 7): The GPRS registration status "Idle, no IMSI" is entered when LR is rejected with cause "GPRS not allowed". The non-GPRS registration status „Idle, no IMSI“ is entered when the cause "IMSI unknown in HLR" is received.						



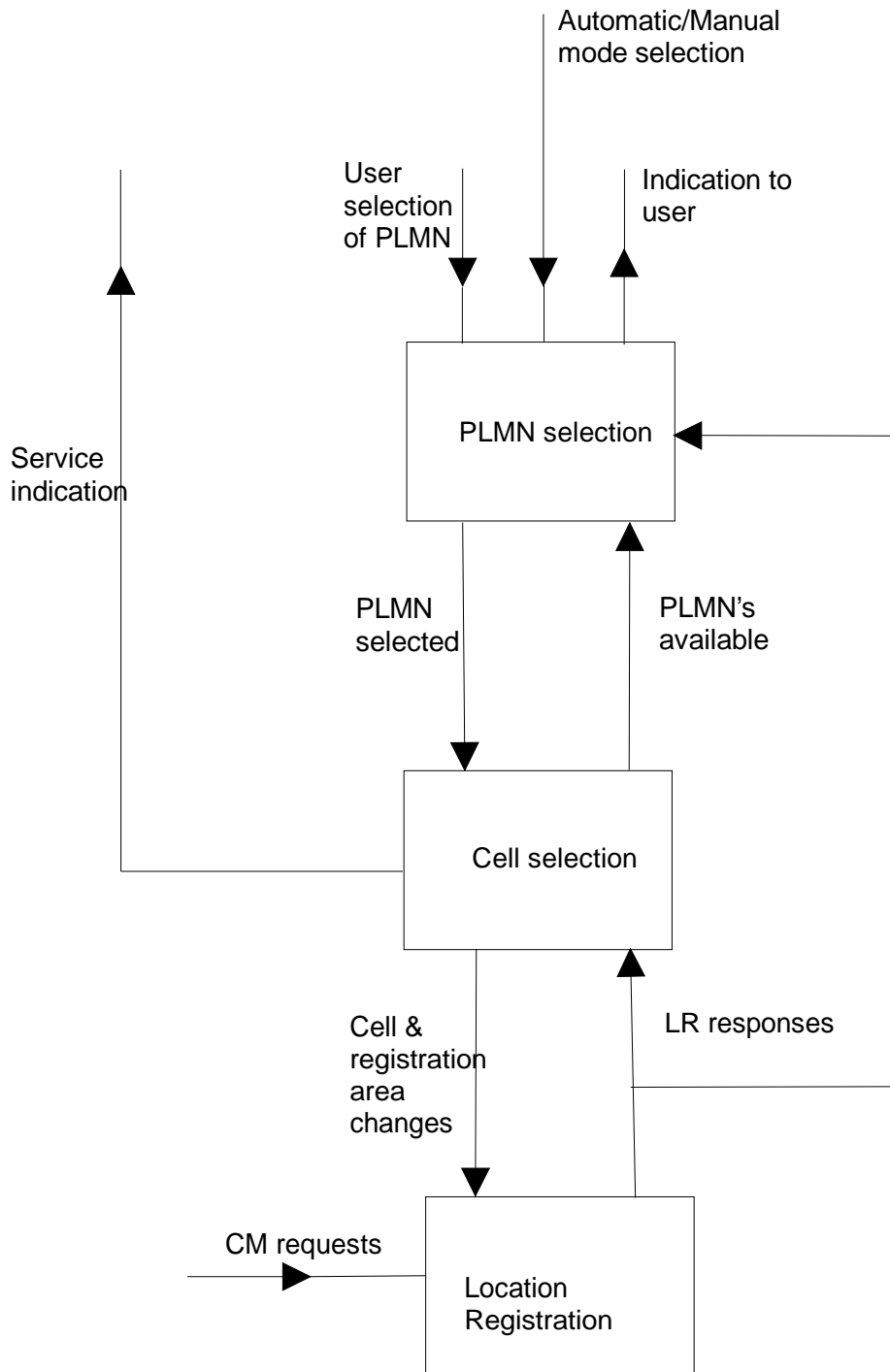
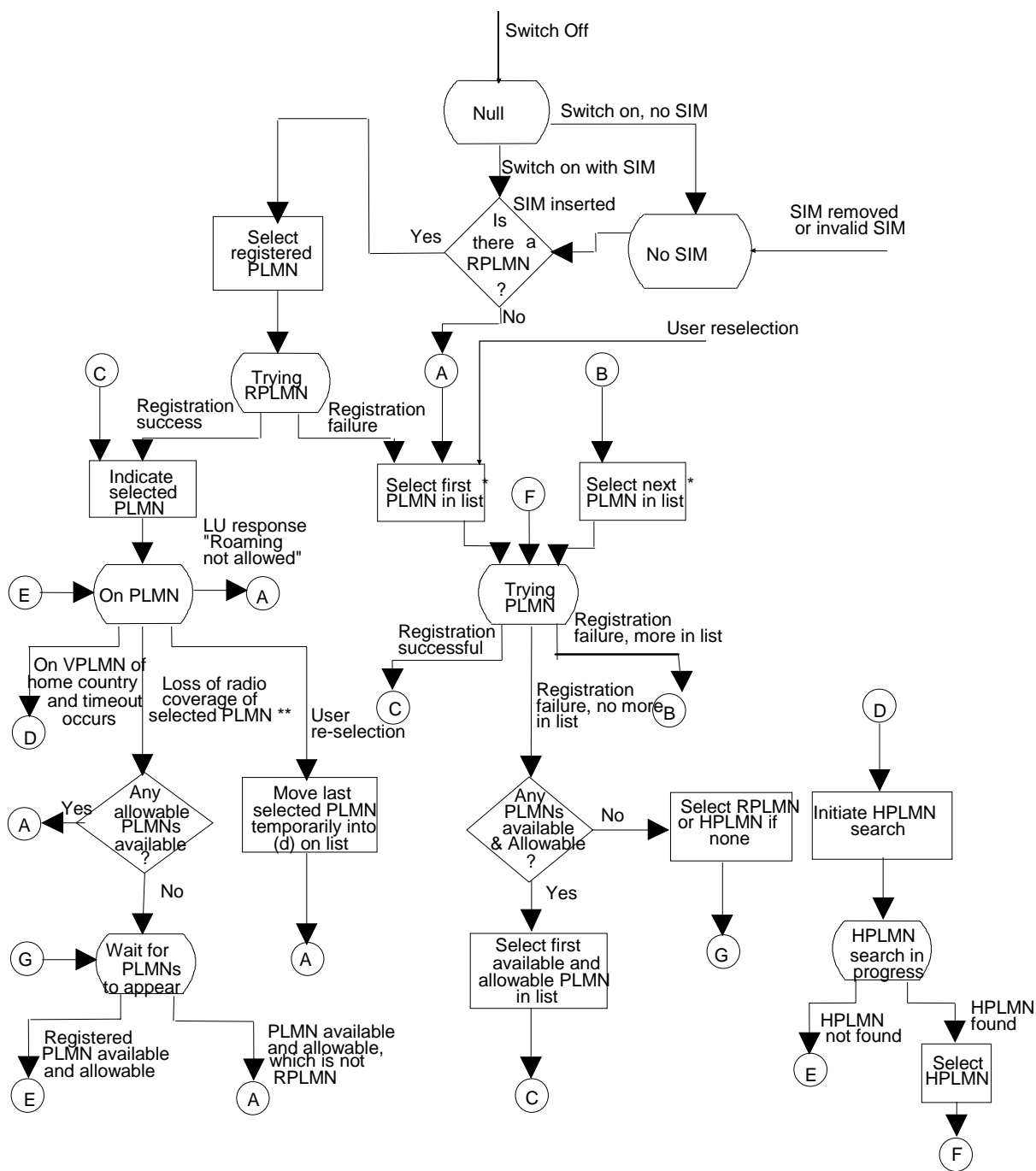


Figure 1: Overall Idle Mode process



\* "List" consists of points i) to v) as defined in section 4.4.3.1.1 except in case of a user re-selection in which case "list" consists of points i) to vi) as defined in section 4.4.3.2.1

\*\* Includes effective loss of coverage due to LAs being forbidden in all potentially suitable cells

Figure 2a: PLMN Selection State diagram (automatic mode)

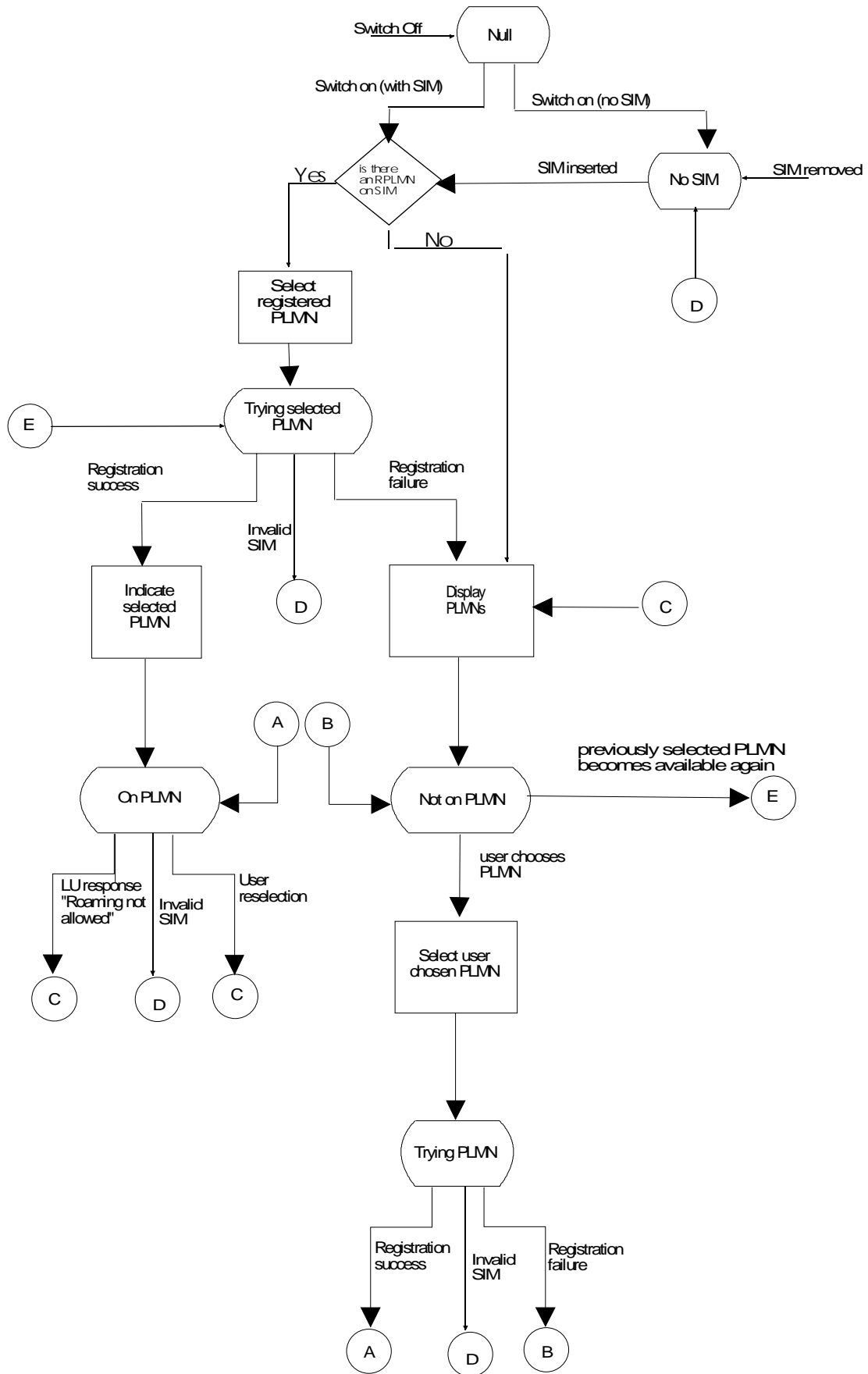
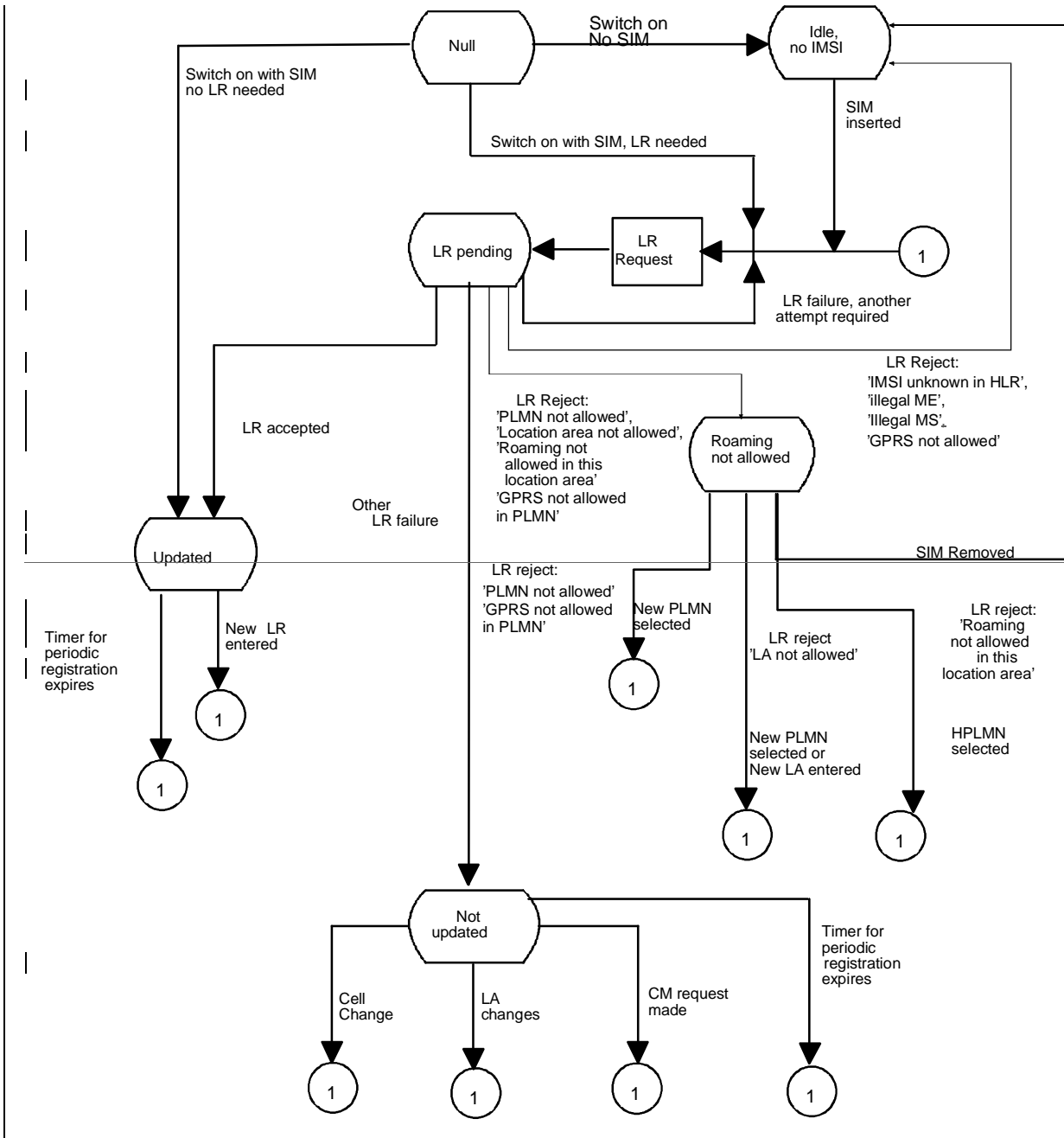
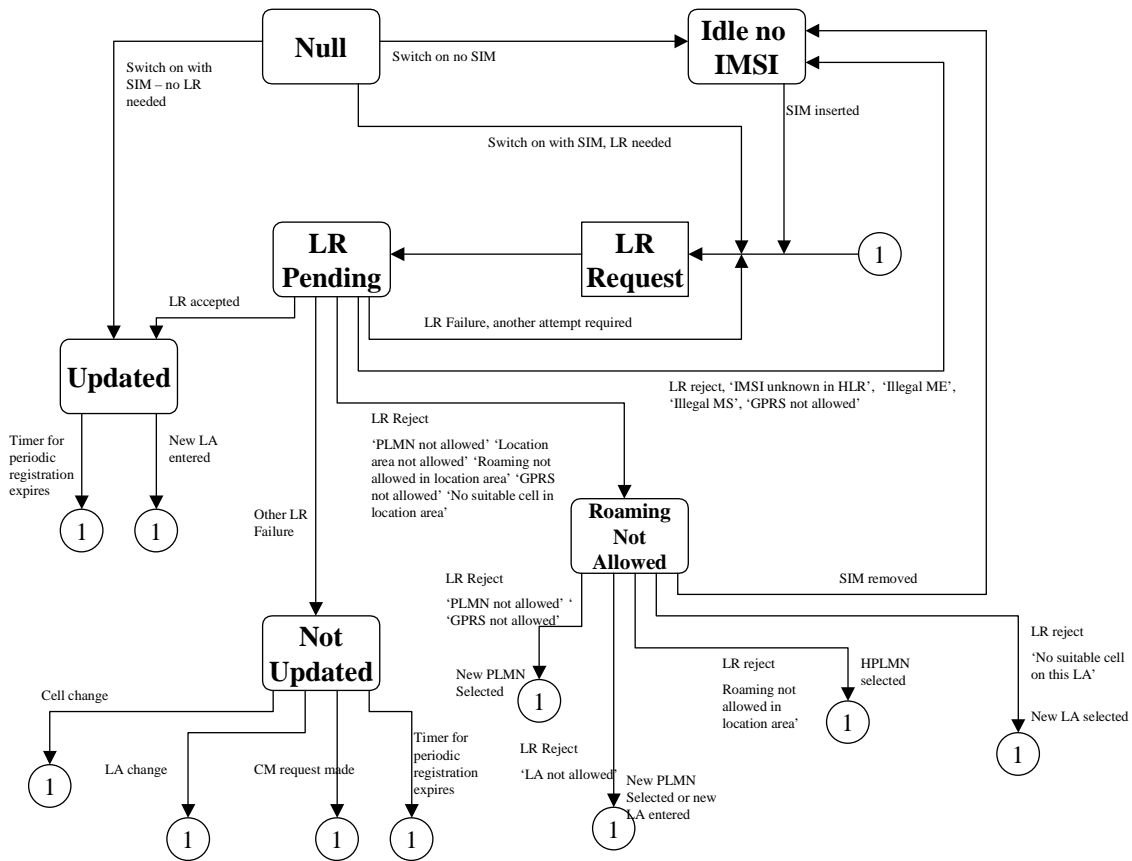


Figure 2b: PLMN Selection State diagram (manual mode)





NOTE 1: Whenever the MS goes to connected mode and then returns to idle mode again the MS selects appropriate state.

NOTE 2: A MS capable of GPRS and non-GPRS services has two Task State machines one for GPRS and one for non-GPRS operation.

Figure 3: Location Registration Task State diagram



## CHANGE REQUEST

⌘ **24.008 CR 332** ⌘ rev **24** ⌘ Current version: **3.7.0** ⌘

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

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

**Title:** ⌘ Length of User-user IE

**Source:** ⌘ Siemens AG

**Work item code:** ⌘ TEI

**Date:** ⌘ 27.04.01

**Category:** ⌘ **F**

**Release:** ⌘ R99

Use one of the following categories:

- F** (essential 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:** ⌘

1) Internal inconsistency:

According to subclause 10.5.4.25, the user-user IE is a type 4 information element with a minimum length of 3 octets and a maximum length of either 35 or 131 octets. As in the User information message the user-user IE is included as a mandatory IE, the IEI is omitted (i.e. the format is LV) and the length must be in the range of 2-130 instead of 3-131. The wrong upper limit was introduced in R98 with CR 04.08-A495. The wrong lower limit was introduced somewhen at the beginning of GSM phase 2. (Note that for the other call control messages, in which the user-user IE is optional, the correct range of 3-131 has been specified.)

2) Interworking problems with ITU-T standard:

ITU-T standard Q.763, ISDN user part – formats and codes, also specifies a range of 2-130 octets for the user-to-user IE in the user-to-user information message, in which the IE is mandatory, and a range of 3-131 octets for other messages in which the IE is optional. If the 3GPP specification is not aligned with Q.763, the following interworking problems may occur:

- If the mobile stations includes a user-user IE with a length of 131 octets (i.e. length indicator + protocol discriminator + 129 octets UUI), this information cannot be transferred via ISUP to another MSC or towards the fixed network. Note that according to TS 22.087, only 128 octets of UUI are supported by the the user-user service. As for the interworking between different networks, TS 22.087 specifies that in case of interworking between a network supporting 128 octets and a network supporting 32 octets of UUI, the UUI shall be truncated to 32 octets, but no indication is given to the originating user. Nothing comparable has been specified for the case of interworking between 129 and 128 octets, and the reaction of a network receiving 129 octets is unpredictable. (Note that it is questionable whether the MSC can apply the error handling of clause 8 and

	<p>discard the last octet of UUI, as the length in subclause 9.3.31 actually corresponds to a UUI of 129 octets.)</p> <p>- According to Q.763 it is allowed to send a user-user IE consisting only of a protocol discriminator, but no UUI. Q.957, the stage 3 specification for DSS1 User-to-User Signalling, explicitly mentions that in case of an implicit activation of user-user service 1, the minimum length for the optional user-to-user IE is 3 octets (= IEI + length indicator + protocol indicator). If an MSC receives a User information message from the fixed network, containing a user-to-user IE of only 2 octets, then the MSC will not be able to deliver this message. Neither ITU nor 3GPP have specified what the MSC should do in this case.</p>
<b>Summary of change:</b> ⌘	<p>It is proposed to correct the maximum length of the User-user IE in the User information message from R98 onwards and the minimum length from R99 onwards.</p> <p>The interworking problem between a R98 or earlier mobile station and a R99 or later network is solved in the following way: In case of a UUI of zero octets the User information message will only be delivered to the MS, if the revision level of the mobile station indicates support of R99 or later versions of TS 24.008.</p>
<b>Consequences if not approved:</b> ⌘	<p>If a mobile station tries to transfer 129 octets of UUI with one User information message, the result is unpredictable. (The UUI may be truncated or discarded or even delivered to the remote party, if this happens to be a mobile station served by the same MSC.)</p> <p>In fixed network -&gt; mobile station direction the usage of an 'empty' UUI which is allowed according to ITU will not be possible, if the remote party is a mobile subscriber.</p>

<b>Clauses affected:</b> ⌘	9.3.31
<b>Other specs affected:</b> ⌘	<input type="checkbox"/> Other core specifications      ⌘ <input type="checkbox"/> Test specifications <input type="checkbox"/> O&M Specifications
<b>Other comments:</b> ⌘	

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## 9.3.1 Alerting

### 9.3.1.1 Alerting (network to mobile station direction)

This message is sent by the network to the calling mobile station to indicate that the called user alerting has been initiated.

See table 9.55/3GPP TS 24.008.

Message type: ALERTING

Significance: global

Direction: network to mobile station

**Table 9.55/3GPP TS 24.008: ALERTING message content (network to mobile station direction)**

IEI	Information element	Type / Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator 10.2	M	V	1/2
	Transaction identifier	Transaction identifier 10.3.2	M	V	1/2
	Alerting message type	Message type 10.4	M	V	1
1C	Facility	Facility 10.5.4.15	O	TLV	2-?
1E	Progress indicator	Progress indicator 10.5.4.21	O	TLV	4
7E	User-user	User-user 10.5.4.25	O	TLV	3-131

#### 9.3.1.1.1 Facility

This information element may be used for functional operation of supplementary services.

#### 9.3.1.1.2 Progress indicator

This information element may be included by the network:

- in order to pass information about the call in progress, e.g., in the event of interworking; and/or
- to make the mobile station attach the user connection for speech.

#### 9.3.1.1.3 User-user

This information element may be included by the network if the called remote user included a *user-user* information element in the ALERTING message.

\*\*\*\*\* **FIRST MODIFIED SECTION** \*\*\*\*\*

## 9.3.31 User information

This message is sent by the mobile station to the network to transfer information to the remote user. This message is also sent by the network to the mobile station to deliver information transferred from the remote user. This message is used if the user-to-user transfer is part of an allowed information transfer as defined in 3GPP TS 24.010.

See table 9.78/3GPP TS 24.008.

Message type: USER INFORMATION

Significance: access

Direction: both

**Table 9.78/3GPP TS 24.008: USER INFORMATION message content**

IEI	Information element	Type / Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator 10.2	M	V	1/2
	Transaction identifier	Transaction identifier 10.3.2	M	V	1/2
	User Information message type	Message type 10.4	M	V	1
	User-user	User-user 10.5.4.25	M	LV	<del>3-131</del> -130
A0	More data	More data 10.5.4.19	O	T	1

### 9.3.31.1 User-user

Some networks may only support a maximum length of 35 octets. Procedures for interworking are not currently defined and are for further study.

R98 and earlier Previous-versions of this protocol specified a minimum length of 3 octets for this information element (not counting the IEI). To avoid interworking problems with mobile stations supporting only R98 or earlier versions of the protocol, the network shall deliver the User information message to these mobile stations only if the length of the User-user IE is greater or equal to 3 octets (not counting the IEI).

### 9.3.31.2 More data

The information element is included by the sending user to indicate that another USER INFORMATION message pertaining to the same message block will follow.

## \*\*\*\*\* SECTION PROVIDED FOR INFORMATION ONLY \*\*\*\*\*

### 10.5.4.25 User-user

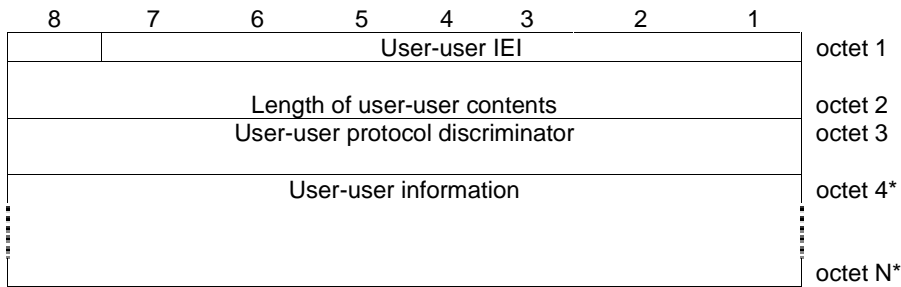
The purpose of the user-user information element is to convey information between the mobile station and the remote ISDN user.

The user-user information element is coded as shown in figure 10.5.114/3GPP TS 24.008 and table 10.5.131/ 3GPP TS 24.008. There are no restrictions on the content of the user-user information field.

The user-user is a type 4 information element with a minimum length of 3 octets and a maximum length of either 35 or 131 octets. In the SETUP message the user-user information element has a maximum size of 35 octets in a GSM PLMN. In the USER INFORMATION, ALERTING, CONNECT, DISCONNECT, PROGRESS, RELEASE and RELEASE COMPLETE messages the user-user information element has a maximum size of 131 octets in a GSM PLMN.

In other networks than GSM PLMNs the maximum size of the user-user information element is 35 or 131 octets in the messages mentioned above. The evolution to a single maximum value is the long term objective; the exact maximum value is the subject of further study.

NOTE: The user-user information element is transported transparently through a GSM PLMN.



**Figure 10.5.114/3GPP TS 24.008 User-user information element**

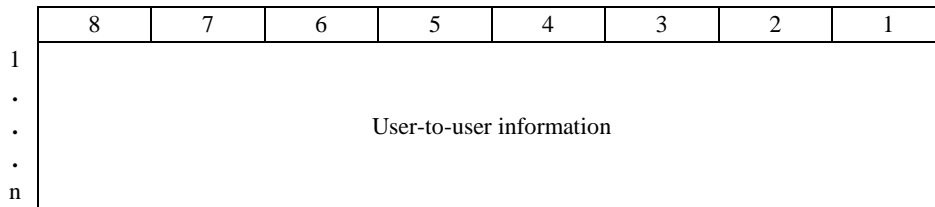
**Table 10.5.131/3GPP TS 24.008: User-user information element**

User-user protocol discriminator (octet 3)								
Bits								
<b>8</b>	<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	
0	0	0	0	0	0	0	0	User specific protocol (Note 1)
0	0	0	0	0	0	0	1	OSI high layer protocols
0	0	0	0	0	0	1	0	X.244 (Note 2)
0	0	0	0	0	0	1	1	Reserved for system management convergence function
0	0	0	0	0	1	0	0	IA5 characters (Note 3)
0	0	0	0	0	1	1	1	Rec.V.120 rate adaption
0	0	0	0	1	0	0	0	Q.931 (I.451) user-network call control messages
0	0	0	1	0	0	0	0	Reserved for other network layer or layer 3 protocols including Rec.X.25 (Note 4)
0	0	1	1	1	1	1	1	
0	1	0	0	0	0	0	0	National use
1	1	0	0	1	1	1	1	
0	1	0	1	0	0	0	0	Reserved for other network layer or layer 3 protocols including Rec.X.25 (Note 4)
1	1	1	1	1	1	1	0	
All other values are reserved.								
Note 1: The user information is structured according to user needs.								
Note 2: The user information is structured according to Rec.X.244 which specifies the structure of X.25 call user data.								
Note 3: The user information consists of IA5 characters.								
Note 4: These values are reserved to discriminate these protocol discriminators from the first octet of a X.25 packet including general format identifier.								

\*\*\*\*\* Annex A: extract from Q.763 (provided for information) \*\*\*\*\*

### 3.61 User-to-user information

The format of the user-to-user information parameter is shown in Figure 58.



**Figure 58/Q.763 – User-to-user information parameter field**

The format of the user-to-user information parameter field is coded identically to the protocol discriminator plus user information field described in Recommendation Q.931.

...

## 4 ISDN user part messages and codes

In Tables 21 to 50, the format and coding of ISDN user part messages are specified. For each message, a list of the relevant parameters is given and for each parameter:

- a reference to the subclause where the formatting and coding of the parameter content is specified;
- the type of the parameter.  
The following types are used in the tables:  
F = mandatory fixed length parameter;  
V = mandatory variable length parameter;  
O = optional parameter of fixed or variable length;
- the length of the parameter.  
The value in the table includes:
  - for type F parameters: the length, in octets, of the parameter content;
  - for type V parameters: the length, in octets, of the length indicator and of the parameter content. The minimum and the maximum length are indicated;
  - for type O parameters: the length, in octets, of the parameter name, length indicator and parameter content. For variable length parameters the minimum and maximum length is indicated.

For each message type, type F parameters and the pointers for the type V parameters must be sent in the order specified in these tables.

The routing label and circuit identification code fields, which are transmitted ahead of the message type field if required, are not shown. Parameter names, pointers to mandatory variable fields and the optional part, and length indicators appear in the message in accordance with Figure 3 and are not shown explicitly in Tables 21 to 50.

Table 21/Q.763

Message Type: Address complete

Parameter	Reference (subclause)	Type	Length (octets)
Message type	2.1	F	1
Backward call indicators	3.5	F	2
Optional backward call indicators	3.37	O	3
Call reference (national use)	3.8	O	7
Cause indicators	3.12	O	4-?
User-to-user indicators	3.60	O	3
User-to-user information	3.61	O	3-131
Access transport	3.3	O	3-?
Generic notification indicator (Note 1)	3.25	O	3
Transmission medium used	3.56	O	3
Echo control information	3.19	O	3
Access delivery information	3.2	O	3
Redirection number (Note 2)	3.46	O	5-?
Parameter compatibility information	3.41	O	4-?
Call diversion information	3.6	O	3
Network specific facility (national use)	3.36	O	4-?
Remote operations (national use)	3.48	O	8-?
Service activation	3.49	O	3-?
Redirection number restriction indicator	3.47	O	3
Conference treatment indicators	3.76	O	3-?
UID action indicators	3.78	O	3-?
End of optional parameters	3.20	O	1
NOTE 1 – This parameter may be repeated.			
NOTE 2 – Peer-to-peer interworking with an earlier version of ISUP may result in format errors and lead to the release of the call.			

....

Table 36/Q.763

Message Type: User-to-user information

Parameter	Reference (subclause)	Type	Length (octets)
Message type	2.1	F	1
User-to-user information	3.61	V	2-130
Access transport	3.3	O	3-?
End of optional parameters	3.20	O	1

NOTE – Parameter compatibility information parameter may be received in the future version.

\*\*\*\*\* Annex B: extract from Q.957 (provided for information) \*\*\*\*\*

**Message Type: ALERTING**

Information element	Reference	Direction	Type	Length
Protocol discriminator	4.2/Q.931	Both	M	1
Call reference	4.3/Q.931	Both	M	2-*
Message type = ALERTING	4.4/Q.931	Both	M	1
Facility	8.2.3/Q.932	Both	O (Note 1)	19
User-to-user	4.5.30/Q.931	Both	O (Note 2)	2-131

NOTE 1 – Always included for activation of service 2. Always included in user-network direction for explicit activation of service 1. Not included otherwise for UUS service 1.

NOTE 2 – May be included for service 1 (explicit or implicit activation) where no contention is allowed.

NOTE 3 – Other mandatory and optional information elements per Recommendation Q.931.

...

**Message Type: SETUP**

Information element	Reference	Direction	Type	Length
Protocol discriminator	4.2/Q.931	Both	M	1
Call reference	4.3/Q.931	Both	M	2-*
Message type = SETUP	4.4/Q.931	Both	M	1
Facility	8.2.3/Q.932	Both	O (Note 1)	19
User-to-user	4.5.30/Q.931	Both	O (Note 2)	2-131

NOTE 1 – Always included for explicit service 1 activation, service 2 activation, and service 3 activation during call establishment.

NOTE 2 – Always included for implicit service 1 activation; the length must be at least three octets. May also be included for service 1 when explicit activation is used. Not included otherwise.

NOTE 3 – Other mandatory and optional information elements per Recommendation Q.931.

...

**Message Type: USER INFORMATION**

Information element	Reference	Direction	Type	Length
Protocol discriminator	4.2/Q.931	Both	M	1
Call reference	4.3/Q.931	Both	M	2-*

Message type = USER INFORMATION	4.4/Q.931	Both	M	1
More data	4.5.19/Q.931	Both	O	1
Facility	8.3.2/Q.932	Both	O (Note 1)	14
User-to-user	4.5.30/Q.931	Both	M	2-131
NOTE 1 – Included in conjunction with interaction with the Conference Call Add-on supplementary service if USER INFORMATION messages are sent/received to/from a specific conferee.				
NOTE 2 – Other mandatory and optional information elements per Recommendation Q.931.				



\*\*\*\* Annex C: extract from TS 24.008 (provided for information) \*\*\*\*

## 9 Message functional definitions and contents

This section defines the structure of the messages of those layer 3 protocols defined in 3GPP TS 24.008. These are standard L3 messages as defined in 3GPP TS 24.007.

Each definition given in the present section includes:

- a) a brief description of the message direction and use, including whether the message has:
  1. Local significance, i.e. relevant only on the originating or terminating access;
  2. Access significance, i.e. relevant in the originating and terminating access, but not in the network;
  3. Dual significance, i.e. relevant in either the originating or terminating access and in the network; or
  4. Global significance, i.e. relevant in the originating and terminating access and in the network.
- b) a table listing the information elements known in the message and their order of their appearance in the message. In messages for circuit-switched call control also a *shift* information element shall be considered as known even if not included in the table. All information elements that may be repeated are explicitly indicated. ( V and LV formatted IEs, which compose the imperative part of the message, occur before T, TV, and TLV formatted IEs which compose the non-imperative part of the message, cf. 3GPP TS 24.007.) In a (maximal) sequence of consecutive information elements with half octet length, the first information element with half octet length occupies bits 1 to 4 of octet N, the second bits 5 to 8 of octet N, the third bits 1 to 4 of octet N+1 etc. Such a sequence always has an even number of elements.

For each information element the table indicates:

1. the information element identifier, in hexadecimal notation, if the IE has format T, TV, or TLV. Usually, there is a default IEI for an information element type; default IEIs of different IE types of the same protocol are different. If the IEI has half octet length, it is specified by a notation representing the IEI as a hexadecimal digit followed by a "-" (example: B-).

NOTE The same IEI may be used for different information element types in different messages of the same protocol.

2. the name of the information element (which may give an idea of the semantics of the element). The name of the information element (usually written in italics) followed by "IE" or "information element" is used in 3GPP TS 24.008 as reference to the information element within a message.
  3. the name of the type of the information element (which indicates the coding of the value part of the IE), and generally, the referenced subsection of section 10 of 3GPP TS 24.008 describing the value part of the information element.
  4. the presence requirement indication (M, C, or O) for the IE as defined in 3GPP TS 24.007.
  5. The format of the information element (T, V, TV, LV, TLV) as defined in 3GPP TS 24.007.
  6. The length of the information element (or permissible range of lengths), in octets, in the message, where "?" means that the maximum length of the IE is only constrained by link layer protocol, and in the case of the Facility IE by possible further conditions specified in 3GPP TS 24.010. This indication is non-normative.
- c) subsections specifying, where appropriate, conditions for IEs with presence requirement C or O in the relevant message which together with other conditions specified in 3GPP TS 24.008 define when the information elements shall be included or not, what non-presence of such IEs means, and - for IEs with presence requirement C - the static conditions for presence and/or non-presence of the IEs (cf. 3GPP TS 24.007).



## CHANGE REQUEST

⌘ **24.008 CR 333** ⌘ rev **2** ⌘ Current version: **4.2.0** ⌘

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

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

**Title:** ⌘ Length of User-user IE

**Source:** ⌘ Siemens AG

**Work item code:** ⌘ TEI

**Date:** ⌘ 27.04.01

**Category:** ⌘ **A**

**Release:** ⌘ REL-4

Use one of the following categories:

- F** (essential 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:** ⌘

1) Internal inconsistency:

According to subclause 10.5.4.25, the user-user IE is a type 4 information element with a minimum length of 3 octets and a maximum length of either 35 or 131 octets. As in the User information message the user-user IE is included as a mandatory IE, the IEI is omitted (i.e. the format is LV) and the length must be in the range of 2-130 instead of 3-131. The wrong upper limit was introduced in R98 with CR 04.08-A495. The wrong lower limit was introduced somewhen at the beginning of GSM phase 2. (In GSM phase 1 the correct range of 2-130 was specified. Note also that in R98 for the other call control messages, in which the user-user IE is optional, the correct range of 3-131 has been specified.)

2) Interworking problems with ITU-T standard:

ITU-T standard Q.763, ISDN user part – formats and codes, also specifies a range of 2-130 octets for the user-to-user IE in the user-to-user information message, in which the IE is mandatory, and a range of 3-131 octets for other messages in which the IE is optional. If the 3GPP specification is not aligned with Q.763, the following interworking problems may occur:

- If the mobile stations includes a user-user IE with a length of 131 octets (i.e. length indicator + protocol discriminator + 129 octets UUI), this information cannot be transferred via ISUP to another MSC or towards the fixed network. Note that according to TS 22.087, only 128 octets of UUI are supported by the the user-user service. As for the interworking between different networks, TS 22.087 specifies that in case of interworking between a network supporting 128 octets and a network supporting 32 octets of UUI, the UUI shall be truncated to 32 octets, but no indication is given to the originating user. Nothing comparable has been specified for the case of interworking between 129 and 128 octets, and the reaction of a network receiving 129 octets is unpredictable. (Note that it is questionable whether the MSC can apply the error handling of clause 8 and

	<p>discard the last octet of UUI, as the length in subclause 9.3.31 actually corresponds to a UUI of 129 octets.)</p> <p>- According to Q.763 it is allowed to send a user-user IE consisting only of a protocol discriminator, but no UUI. Q.957, the stage 3 specification for DSS1 User-to-User Signalling, explicitly mentions that in case of an implicit activation of user-user service 1, the minimum length for the optional user-to-user IE is 3 octets (= IEI + length indicator + protocol indicator). If an MSC receives a User information message from the fixed network, containing a user-to-user IE of only 2 octets, then the MSC will not be able to deliver this message. Neither ITU nor 3GPP have specified what the MSC should do in this case.</p>
<b>Summary of change:</b> ⌘	<p>It is proposed to correct the maximum length of the User-user IE in the User information message from R98 onwards and the minimum length from R99 onwards.</p> <p>The interworking problem between a R98 or earlier mobile station and a R99 or later network is solved in the following way: In case of a UUI of zero octets the User information message will only be delivered to the MS, if the revision level of the mobile station indicates support of R99 or later versions of TS 24.008.</p>
<b>Consequences if not approved:</b> ⌘	<p>If a mobile station tries to transfer 129 octets of UUI with one User information message, the result is unpredictable. (The UUI may be truncated or discarded or even delivered to the remote party, if this happens to be a mobile station served by the same MSC.)</p> <p>In fixed network -&gt; mobile station direction the usage of an 'empty' UUI which is allowed according to ITU will not be possible, if the remote party is a mobile subscriber.</p>

<b>Clauses affected:</b> ⌘	9.3.31
<b>Other specs affected:</b> ⌘	<input type="checkbox"/> Other core specifications      ⌘ <input type="checkbox"/> Test specifications <input type="checkbox"/> O&M Specifications
<b>Other comments:</b> ⌘	

**How to create CRs using this form:**

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- 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://www.3gpp.org/specs/> For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.

### 9.3.31 User information

This message is sent by the mobile station to the network to transfer information to the remote user. This message is also sent by the network to the mobile station to deliver information transferred from the remote user. This message is used if the user-to-user transfer is part of an allowed information transfer as defined in 3GPP TS 24.010.

See table 9.78/3GPP TS 24.008.

Message type: USER INFORMATION

Significance: access

Direction: both

**Table 9.78/3GPP TS 24.008: USER INFORMATION message content**

IEI	Information element	Type / Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator 10.2	M	V	1/2
	Transaction identifier	Transaction identifier 10.3.2	M	V	1/2
	User Information message type	Message type 10.4	M	V	1
	User-user	User-user 10.5.4.25	M	LV	<del>3-1312-130</del>
A0	More data	More data 10.5.4.19	O	T	1

#### 9.3.31.1 User-user

Some networks may only support a maximum length of 35 octets. Procedures for interworking are not currently defined and are for further study.

R98 and earlier versions of this protocol specified a minimum length of 3 octets for this information element (not counting the IEI). To avoid interworking problems with mobile stations supporting only R98 or earlier versions of the protocol, the network shall deliver the User information message to these mobile stations only if the length of the User-user IE is greater or equal to 3 octets (not counting the IEI).

#### 9.3.31.2 More data

The information element is included by the sending user to indicate that another USER INFORMATION message pertaining to the same message block will follow.

## CHANGE REQUEST

⌘ 24.008 CR 415 ⌘ rev 3 ⌘ Current version: 3.7.0 ⌘

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

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

<b>Title:</b>	⌘ Partial Roaming – restriction by Location area		
<b>Source:</b>	⌘ Hutchison3g		
<b>Work item code:</b>	⌘ TEI	<b>Date:</b>	⌘ 27-04-01
<b>Category:</b>	⌘ F	<b>Release:</b>	⌘ R99
<i>Use <u>one</u> of the following categories:</i>		<i>Use <u>one</u> of the following releases:</i>	
F (essential correction)		2 (GSM Phase 2)	
A (corresponds to a correction in an earlier release)		R96 (Release 1996)	
B (Addition of feature),		R97 (Release 1997)	
C (Functional modification of feature)		R98 (Release 1998)	
D (Editorial modification)		R99 (Release 1999)	
Detailed explanations of the above categories can be found in 3GPP TR 21.900.		REL-4 (Release 4)	
		REL-5 (Release 5)	

**Reason for change:** ⌘ Revision 3

Added note to Annex G.2 to clarify difference between #12 and #15 cause values

Revision 2

Replaced word ‘another’ with ‘a’ in new text in all sections.

Replaced new cause value name with ‘No Suitable Cells In Location Area’

Removed some additional ‘or’ to comply with drafting rules

Added cross reference to 23.122 change requests on cover sheet

Revision 1

Changes made as discussed at CN1 R99 Ad Hoc, 8/9<sup>th</sup> May 2001, as follows

Section 4.4.4.7 – changed ‘will’ to ‘shall’

Some additions of “and#15” in text were missed in the original, added in sections 4.7.4.2.2, 4.7.5.1.4, 4.7.5.2.4, and 4.7.13.4

Amended text in Annex G.2 to remove reference to geographic area.

Revision 0

This was recognised as a potential problem in the UE Idle Mode Workshop in Helsinki earlier this year, but no changes have yet been proposed as companies have concentrated on other issues related to roaming, namely Equivalent PLMN codes and Idle Mode search procedures, which themselves were key changes to enable roaming in a 2G/3G environment.

This change reflects the agreement reached in the CN1/SA1 Network Selection Joint Ad

	Hoc meeting held on 8 <sup>th</sup> May 2001 in Helsinki.
	Partial roaming occurs when a mobile has access to a PLMN, but only to a limited set of location areas.
<b>Summary of change:</b>	⌘ The addition of 'No Suitable Cells In Location Area' is added to Location Update Reject and Routing Area Reject messages.
<b>Consequences if not approved:</b>	⌘ National and international roaming will not operate correctly when an operator uses a single PLMN code for both parts of network and partial or restricted roaming agreements are in place.

<b>Clauses affected:</b>	⌘ 4.4.4.5, 4.4.4.7, 4.7.3, 4.7.3.1.4, 4.7.3.2.4, 4.7.4.2.2, 4.7.5.1.4, 4.7.5.2.4, 4.7.13.4, 10.5.3.6, 10.5.5.14, Annex G.2
<b>Other specs affected:</b>	⌘ <input checked="" type="checkbox"/> Other core specifications ⌘ 23.122 <input type="checkbox"/> Test specifications <input type="checkbox"/> O&M Specifications
<b>Other comments:</b>	⌘

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- 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.

#### 4.4.4.5 Attempt Counter

To limit the number of location updating attempts made, where location updating is unsuccessful, an attempt counter is used. It counts the number of consecutive unsuccessful location update attempts.

The attempt counter is incremented when a location update procedure fails. The specific situations ~~is~~ are specified in section 4.4.4.9.

The attempt counter is reset when:

- the mobile station is powered on;
- a SIM is inserted;
- location update is successfully completed;
- location update completed with cause #11, #12, #13 or #13-15 (see section 4.4.4.7).

and in case of service state ATTEMPTING to UPDATE:

- a MS detects that a new location area is entered;
- expiry of timer T3212;
- location update is triggered by CM sublayer requests.

The attempt counter is used when deciding whether to re-attempt a location update after timeout of timer T3211.

#### 4.4.4.6 Location updating accepted by the network

If the location updating is accepted by the network a LOCATION UPDATING ACCEPT message is transferred to the mobile station.

In case the identity confidentiality service is active (see section 4.3.1 and 4.4.4.4), the TMSI reallocation may be part of the location updating procedure. The TMSI allocated is then contained in the LOCATION UPDATING ACCEPT message together with the location area identifier LAI. The network shall in this case start the supervision timer T3250 as described in section 4.3.1.

If the network wishes to prolong the RR connection to allow the mobile station to initiate MM connection establishment (for example if the mobile station has indicated in the LOCATION UPDATING REQUEST that it has a follow-on request pending) the network shall send "follow on proceed" in the LOCATION UPDATING ACCEPT and start timer T3255.

The mobile station receiving a LOCATION UPDATING ACCEPT message shall store the received location area identification LAI, stop timer T3210, reset the attempt counter and set the update status in the SIM to UPDATED. If the message contains an IMSI, the mobile station is not allocated any TMSI, and shall delete any TMSI in the SIM accordingly. If the message contains a TMSI, the mobile station is allocated this TMSI, and shall store this TMSI in the SIM and a TMSI REALLOCATION COMPLETE shall be returned to the network. If neither IMSI nor TMSI is received in the LOCATION UPDATING ACCEPT message, the old TMSI if any available shall be kept.

If the LAI or PLMN identity contained in the LOCATION UPDATING ACCEPT message is a member of any of the "forbidden lists" then any such entries shall be deleted.

The network may also send a list of "equivalent PLMNs" in the LOCATION UPDATING ACCEPT message. Each entry of the list contains a PLMN code (MCC+MNC). The mobile station shall store the list, as provided by the network, except that any PLMN code that is already in the "forbidden PLMN list" shall be removed from the "equivalent PLMNs" list before it is stored by the mobile station. In addition the mobile station shall add to the stored list the PLMN code of the network that sent the list. All PLMNs in the stored list shall be regarded as equivalent to each other for PLMN selection, cell selection/re-selection and handover. The stored list in the mobile station shall be replaced on each occurrence of the LOCATION UPDATING ACCEPT message. If no list is contained in the message, then the stored list in the mobile station shall be deleted. The list shall be stored in the mobile station while switched off so that it can be used for PLMN selection after switch on.



After that, the mobile station shall act according to the presence of the "Follow-on proceed" information element in the LOCATION UPDATING ACCEPT; if this element is present and the mobile station has a CM application request pending, it shall send a CM SERVICE REQUEST to the network and proceed as in section 4.5.1.1. Otherwise, it shall start timer T3240 and enter state WAIT FOR NETWORK COMMAND.

Furthermore, the network may grant authorisation for the mobile station to use GSM-Cordless Telephony System (CTS) in the Location Area and its immediate neighbourhood. The mobile should memorise this permission in non-volatile memory. If the "CTS permission" IE is not present in the message, the mobile is not authorised to use GSM-CTS, and shall accordingly delete any memorised permission.

NOTE: the interaction between CTS and GPRS procedures are not yet defined.

#### 4.4.4.7 Location updating not accepted by the network

If the location updating cannot be accepted the network sends a LOCATION UPDATING REJECT message to the mobile station. The mobile station receiving a LOCATION UPDATING REJECT message shall stop the timer T3210, store the reject cause, delete the list of "equivalent PLMNs", start T3240, enter state LOCATION UPDATING REJECTED await the release of the RR connection triggered by the network. Upon the release of the RR connection the mobile station shall take the following actions depending on the stored reject cause:

# 2: IMSI unknown in HLR;

# 3: Illegal MS; or

# 6: Illegal ME.

The mobile station shall set the update status to ROAMING NOT ALLOWED (and store it in the SIM according to section 4.1.2.2), and delete any TMSI, stored LAI and ciphering key sequence number and shall consider the SIM as invalid until switch-off or the SIM is removed.

# 11: PLMN not allowed;

# 12: Location Area not allowed; or

# 13: Roaming not allowed in this location area; or

# 15: No Suitable Cells In Location Area;

The mobile station shall delete any LAI, TMSI and ciphering key sequence number stored in the SIM, reset the attempt counter, set the update status to ROAMING NOT ALLOWED (and store it in the SIM according to section 4.1.2.2). The mobile station shall store the LAI or the PLMN identity in the suitable forbidden list, i.e. in the "forbidden PLMN list" for cause #11, in the list of "forbidden location areas for regional provision of service" for cause #12, and in the list of "forbidden location areas for roaming" for cause #13 and #15. In addition, the MS ~~will~~ shall memorize if cause #13 was received, so to perform a PLMN selection instead of a cell selection when back to the MM IDLE state. The MS shall search for a suitable cell in another location area in the same PLMN if cause #15 is received.

Other values are considered as abnormal cases and the specification of the mobile station behaviour in those cases is given in section 4.4.4.9.

### 4.7.3 GPRS attach procedure

The GPRS attach procedure is used for two purposes:

- normal GPRS attach, performed by the MS to IMSI attach for GPRS services only. The normal GPRS attach procedure shall be used by GPRS MSs in MS operation mode C, independent of the network operation mode. It shall also be used by GPRS MSs in MS operation modes A or B if the network operates in network operation mode II or III .
- combined GPRS attach procedure, used by GPRS MSs in MS operation modes A or B to attach the IMSI for GPRS and non-GPRS services provided that the network operates in network operation mode I.

With a successful GPRS attach procedure a GMM context is established.

Section 4.7.3.1 describes the GPRS attach procedure to attach the IMSI only for GPRS services. The combined GPRS attach procedure used to attach the IMSI for both GPRS and non-GPRS services is described in section 4.7.3.2.

If an IMSI attach for non-GPRS services is requested and a GMM context exists, the routing area updating procedure shall be used as described in section 4.7.5.2.

To limit the number of subsequently rejected attach attempts, a GPRS attach attempt counter is introduced. The GPRS attach attempt counter shall be incremented as specified in section 4.7.3.1.5. Depending on the value of the GPRS attach attempt counter, specific actions shall be performed. The GPRS attach attempt counter shall be reset when:

- the MS is powered on;
- a SIM is inserted;
- a GPRS attach procedure is successfully completed; or
- a combined GPRS attach procedure is completed for GPRS services only with cause #2, #16, #17 or #22
- a GPRS attach procedure is completed with cause #11, #12, #13 or #1315,

and additionally when the MS is in substate ATTEMPTING-TO-ATTACH:

- expiry of timer T3302;
- a new routing area is entered; or
- an attach is triggered by CM sublayer requests.

The mobile equipment shall contain a list of "forbidden location areas for roaming", as well as a list of "forbidden location areas for regional provision of service". The handling of these lists is described in section 4.4.1; the same lists are used by GMM and MM procedures.

#### 4.7.3.1 GPRS attach procedure for GPRS services

The GPRS attach procedure is a GMM procedure used by GPRS MSs to IMSI attach for GPRS services.

The attach type information element shall indicate "GPRS attach".

The Mobile Equipment shall contain a list of "equivalent PLMNs". The handling of this list is described in section 4.4.1, the same list is used by GMM and MM procedures.

##### 4.7.3.1.1 GPRS attach procedure initiation

In state GMM-DEREGISTERED, the MS initiates the GPRS attach procedure by sending an ATTACH REQUEST message to the network, starts timer T3310 and enters state GMM-REGISTERED-INITIATED.

The MS capable both UMTS and GSM or only GSM system shall include a valid P-TMSI, if any is available, the P-TMSI signature associated with the P-TMSI and the routing area identity associated with the P-TMSI in the ATTACH

REQUEST message. If there is no valid P-TMSI available, the IMSI shall be included instead of the P-TMSI and P-TMSI signature.

The MS shall also indicate within the DRX parameters whether it supports the split pg cycle option on CCCH. The optional support of the split pg cycle on CCCH by the network is indicated in SI13 or PSI1. Split pg cycle on CCCH is applied by both the network and the MS when the split pg cycle option is supported by both (see GSM 05.02).

In UMTS, if the MS wishes to prolong the established PS signalling connection after the GPRS attach procedure, it may set a follow-on request pending indicator on.

#### 4.7.3.1.2 GMM common procedure initiation

The network may initiate GMM common procedures, e.g. the GMM identification and GMM authentication and ciphering procedure, depending on the received information such as IMSI, CKSN, old RAI, P-TMSI and P-TMSI signature.

#### 4.7.3.1.3 GPRS attach accepted by the network

If the GPRS attach request is accepted by the network, an ATTACH ACCEPT message is sent to the MS.

The P-TMSI reallocation may be part of the GPRS attach procedure. The P-TMSI that shall be allocated is then included in the ATTACH ACCEPT message together with the routing area identifier. The network shall, in this case, change to state GMM-COMMON-PROCEDURE-INITIATED and shall start timer T3350 as described in section 4.7.6. Furthermore, the network may assign a P-TMSI signature for the GMM context which is then also included in the ATTACH ACCEPT message. If the LAI or PLMN identity that has been transmitted in the ATTACH ACCEPT message is a member of any of the "forbidden" lists, any such entry shall be deleted. Additionally, the network shall include the radio priority level to be used by the MS for mobile originated SMS transfer in the ATTACH ACCEPT message.

In GSM, the Cell Notification information element shall be included in the ATTACH ACCEPT message by the network which indicates that the Cell Notification is supported by the network.

In UMTS, the network should prolong the PS signalling connection if the mobile station has indicated a follow-on request pending in ATTACH REQUEST. The network may also prolong the PS signalling connection without any indication from the mobile terminal.

The MS, receiving an ATTACH ACCEPT message, stores the received routing area identification, stops timer T3310, reset the GPRS attach attempt counter, reset the routing area updating attempt counter, enters state GMM-REGISTERED and sets the GPRS update status to GU1 UPDATED.

If the message contains a P-TMSI, the MS shall use this P-TMSI as the new temporary identity for GPRS services. In this case, an ATTACH COMPLETE message is returned to the network. The MS shall delete its old P-TMSI and shall store the new one. If no P-TMSI has been included by the network in the ATTACH ACCEPT message, the old P-TMSI, if any available, shall be kept.

If the message contains a P-TMSI signature, the MS shall use this P-TMSI signature as the new temporary signature for the GMM context. The MS shall delete its old P-TMSI signature, if any is available, and shall store the new one. If the message contains no P-TMSI signature, the old P-TMSI signature, if available, shall be deleted.

The network may also send a list of "equivalent PLMNs" in the ATTACH ACCEPT message. Each entry of the list contains a PLMN code (MCC+MNC). The mobile station shall store the list, as provided by the network, except that any PLMN code that is already in the "forbidden PLMN" list shall be removed from the "equivalent PLMNs" list before it is stored by the mobile station. In addition the mobile station shall add to the stored list the PLMN code of the network that sent the list. All PLMNs in the stored list shall be regarded as equivalent to each other for PLMN selection, cell selection/re-selection and handover. The stored list in the mobile station shall be replaced on each occurrence of the ATTACH ACCEPT message. If no list is contained in the message, then the stored list in the mobile station shall be deleted. The list shall be stored in the mobile station while switched off so that it can be used for PLMN selection after switch on.

After that in UMTS, if the mobile station has indicated follow-on request pending and has a CM application request pending, it shall send an appropriate message (for example ACTIVATE PDP CONTEXT REQUEST) to the network.

In GSM, if the ATTACH ACCEPT message contains the Cell Notification information element, then the MS shall start to use the LLC NULL frame to perform cell updates. The network receiving an ATTACH COMPLETE message stops

timer T3350, changes to GMM-REGISTERED state and considers the P-TMSI sent in the ATTACH ACCEPT message as valid.

#### 4.7.3.1.4 GPRS attach not accepted by the network

If the attach request cannot be accepted by the network, an ATTACH REJECT message is transferred to the MS. The MS receiving the ATTACH REJECT message, deletes the list of "equivalent PLMNs", stops timer T3310 and takes one of the following actions depending upon the reject cause:

# 3 (Illegal MS); or

# 6 (Illegal ME)

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number. The new GMM state is GMM-DEREGISTERED. The SIM shall be considered as invalid for GPRS services until switching off or the SIM is removed.

If the MS is IMSI attached via MM procedures, the MS shall in addition set the update status to U3 ROAMING NOT ALLOWED, shall delete any TMSI, LAI and ciphering key sequence number. The new MM state is MM IDLE. The SIM shall be considered as invalid also for non-GPRS services until switching off or the SIM is removed.

# 7 (GPRS services not allowed)

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number. The SIM shall be considered as invalid for GPRS services until switching off or the SIM is removed. The new state is GMM-DEREGISTERED.

# 8 (GPRS services and non-GPRS services not allowed)

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (shall store it according to section 4.1.3.2) and shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number. The new GMM state is GMM-DEREGISTERED. The new MM state is MM IDLE.

The MS shall set the update status to U3 ROAMING NOT ALLOWED, shall delete any TMSI, LAI and ciphering key sequence number. The SIM shall be considered as invalid for GPRS and non-GPRS services until switching off or the SIM is removed.

# 11 (PLMN not allowed)

# 12 (Location area not allowed); ~~or~~

# 13 (Roaming not allowed in this location area) ; or

# 15 (No Suitable Cells In Location Area) ;

The MS shall delete any RAI, P-TMSI, P-TMSI signature, and GPRS ciphering key sequence number stored, shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2), shall reset the GPRS attach attempt counter and shall change to state GMM-DEREGISTERED.

If the MS is IMSI attached via MM procedures, the MS shall in addition set the update status to U3 ROAMING NOT ALLOWED, shall delete any TMSI, LAI and ciphering key sequence number. and shall reset the location update attempt counter. The new MM state is MM IDLE.

The MS shall store the LAI or the PLMN identity in the appropriate forbidden list, i.e. in the "forbidden PLMN list" for cause #11, in the list of "forbidden location areas for regional provision of service" for cause #12, ~~or~~ in the list of "forbidden location areas for roaming" for cause #13 or #15. If cause #11 or #13 was received, the MS shall perform a PLMN selection instead of a cell selection. If cause #15 was received the MS shall search for a suitable cell in a different location area on the same PLMN.

# 14 (GPRS services not allowed in this PLMN)

The MS shall delete any RAI, P-TMSI, P-TMSI signature, and GPRS ciphering key sequence number stored, shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and shall change to state GMM-DEREGISTERED.

The MS shall store the PLMN identity in the "forbidden PLMNs for GPRS service" list. A GPRS MS operating in MS operation mode C shall perform a PLMN selection instead of a cell selection.

A GPRS MS operating in MS operation mode A or B in network operation mode II or III, is still IMSI attached for CS services in the network.

Other values are considered as abnormal cases. The specification of the MS behaviour in those cases is specified in section 4.7.3.1.5.

#### 4.7.3.1.5 Abnormal cases in the MS

The following abnormal cases can be identified:

- a) Access barred because of access class control

The GPRS attach procedure shall not be started. The MS stays in the current serving cell and applies normal cell reselection process. The GPRS attach procedure is started as soon as possible, i.e. when access is granted or because of a cell change.

- b) Lower layer failure before the ATTACH ACCEPT or ATTACH REJECT message is received

The procedure shall be aborted. The MS shall proceed as described below.

- c) T3310 time-out

On the first expiry of the timer, the MS reset and restart timer T3310 and shall retransmit the ATTACH REQUEST message. This retransmission is repeated four times, i.e. on the fifth expiry of timer T3310, the GPRS attach procedure shall be aborted and the MS shall proceed as described below.

- d) ATTACH REJECT, other causes than those treated in section 4.7.3.1.4

The MS shall proceed as described below.

- e) Change of cell within the same RA (GSM only)

If a cell change occurs within the same RA when the MS is in state GMM-REGISTERED-INITIATED, then the cell update procedure shall be performed before completion of the attach procedure.

- f) Change of cell into a new routing area

If a cell change into a new routing area occurs before an ATTACH ACCEPT or ATTACH REJECT message has been received, the GPRS attach procedure shall be aborted and re-initiated immediately. If a routing area border is crossed when the ATTACH ACCEPT message is received but before an ATTACH COMPLETE message is sent, the GPRS attach procedure shall be aborted and the routing area updating procedure shall be initiated. If a P-TMSI was allocated during the GPRS attach procedure, this P-TMSI shall be used in the routing area updating procedure. If a P-TMSI signature was allocated together with the P-TMSI during the GPRS attach procedure, this P-TMSI signature shall be used in the routing area updating procedure.

- g) Mobile originated detach required

If the MS is in state GMM-REGISTERED-INITIATED, the GPRS attach procedure shall be aborted and the GPRS detach procedure shall be performed (see 4.7.4.1).

- h) Procedure collision

If the MS receives a DETACH REQUEST message from the network in state GMM-REGISTERED-INITIATED with type of detach re-attach not required, the GPRS detach procedure shall be progressed and the GPRS attach procedure shall be aborted. Otherwise the GPRS attach procedure shall be progressed and the DETACH REQUEST message shall be ignored.

In cases b, c and d the MS shall proceed as follows. Timer T3310 shall be stopped if still running. The GPRS attach attempt counter shall be incremented.

If the GPRS attach attempt counter is less than 5:

- timer T3311 is started and the state is changed to GMM-DEREGISTERED.ATTEMPTING-TO-ATTACH.

If the GPRS attach attempt counter is greater than or equal to 5:

- the MS shall delete any RAI, P-TMSI, P-TMSI signature, and GPRS ciphering key sequence number, shall set the GPRS update status to GU2 NOT UPDATED, shall start timer T3302. The state is changed to GMM-DEREGISTERED..ATTEMPTING-TO-ATTACH or optionally to GMM-DEREGISTERED.PLMN-SEARCH (see 4.2.4.1.2).
- In UMTS, in case c the MS shall release the PS signaling connection and in case d the network shall release the PS signaling connection for this MS (see 3GPP TS 25.331).

#### 4.7.3.1.6 Abnormal cases on the network side

The following abnormal cases can be identified:

##### a) Lower layer failure

If a low layer failure occurs before the message ATTACH COMPLETE has been received from the MS and a new P-TMSI (or a new P-TMSI and a new P-TMSI signature) has been assigned, the network shall consider both the old and new P-TMSI each with its corresponding P-TMSI-signature as valid until the old P-TMSI can be considered as invalid by the network (see section 4.7.1.5) and shall not resent the message ATTACH ACCEPT. During this period the network may:

- use the identification procedure followed by a P-TMSI reallocation procedure if the old P-TMSI is used by the MS in a subsequent message.

##### b) Protocol error

If the ATTACH REQUEST message is received with a protocol error, the network shall return an ATTACH REJECT message with one of the following reject causes:

- #96: Mandatory information element error;
- #99: Information element non-existent or not implemented;
- #100: Conditional IE error;
- #111: Protocol error, unspecified.

##### c) T3350 time-out

On the first expiry of the timer, the network shall retransmit the ATTACH ACCEPT message and shall reset and restart timer T3350.

This retransmission is repeated four times, i.e. on the fifth expiry of timer T3350, the GPRS attach procedure shall be aborted. If a new P-TMSI or a new P-TMSI together with a new P-TMSI signature were allocated in the ATTACH ACCEPT message, the network shall consider both the old and new P-TMSI each together with the corresponding P-TMSI signatures as valid until the old P-TMSI can be considered as invalid by the network (see section 4.7.1.5). During this period the network acts as specified for case a.

##### d.1) ATTACH REQUEST received

- If one or more of the information elements in the ATTACH REQUEST message differ from the ones received within the previous ATTACH REQUEST message, the previously initiated GPRS attach procedure shall be aborted and the new GPRS attach procedure shall be progressed, or
- If no information element differ, then the ATTACH ACCEPT message shall be resent.

##### d.2) More than one ATTACH REQUEST received and no ATTACH ACCEPT or ATTACH REJECT message has been sent

- If one or more of the information elements in the ATTACH REQUEST message differs from the ones received within the previous ATTACH REQUEST message, the previously initiated GPRS attach procedure shall be aborted and the new GPRS attach procedure shall be progressed;
- If the information elements do not differ, then the network shall continue with the previous attach procedure and shall not treat any further this ATTACH REQUEST message.

e) ATTACH REQUEST received in state GMM-REGISTERED

If an ATTACH REQUEST message is received in state GMM-REGISTERED the network may initiate the GMM common procedures; if it turned out that the ATTACH REQUEST message was send by an MS that has already been attached, the GMM context and PDP contexts, if any, are deleted and the new ATTACH REQUEST is progressed.

f) ROUTING AREA UPDATE REQUEST message received before ATTACH COMPLETE message.

Timer T3350 shall be stopped. The allocated P-TMSI shall be considered as valid and the routing area updating procedure shall be progressed as described in section 4.7.5.

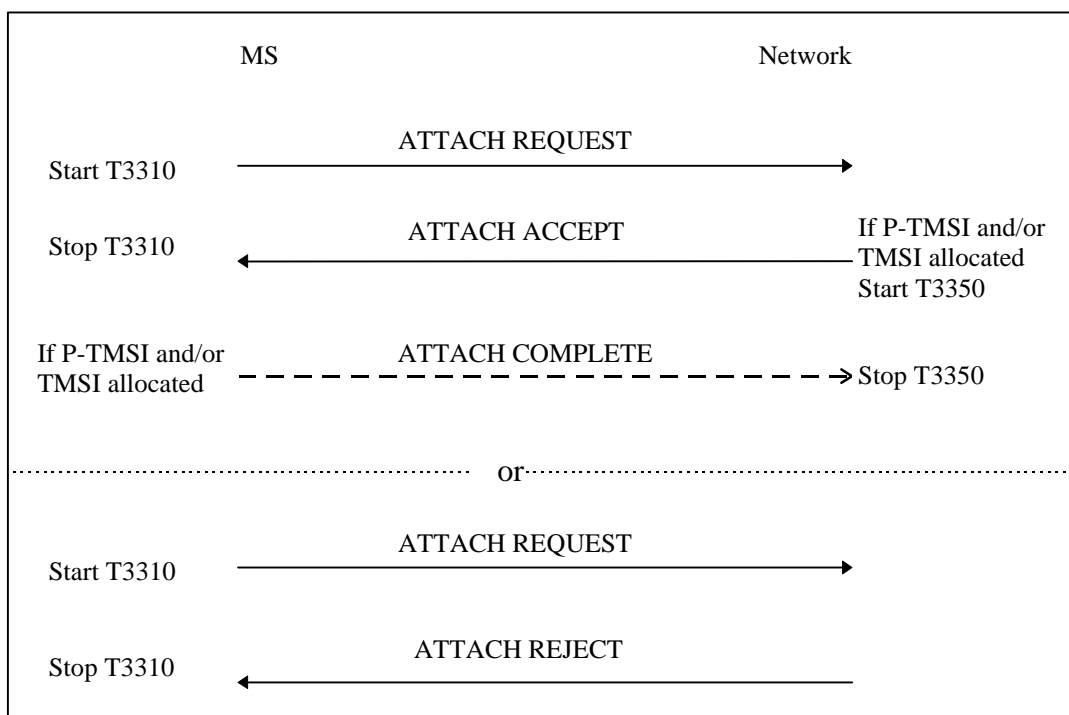


Figure 4.7.3/1 3GPP TS 24.008: GPRS attach procedure and combined GPRS attach procedure

### 4.7.3.2 Combined GPRS attach procedure for GPRS and non-GPRS services

The combined GPRS attach procedure is a GMM procedure used by a GPRS MS operating in MS operation modes A or B for IMSI attach for GPRS and non-GPRS services if the network operates in network operation mode I.

If a GPRS MS operating in MS operation modes A or B is already attached for non-GPRS services by use of the MM specific IMSI attach procedure, but additionally wishes to perform an IMSI attach for GPRS services, the combined GPRS attach procedure shall also be used.

The attach type information element shall indicate "combined GPRS attach". In this case, the messages ATTACH ACCEPT, ATTACH COMPLETE, and ATTACH REJECT used by the combined GPRS attach procedure carry information for both the GPRS and the non-GPRS services.

#### 4.7.3.2.1 Combined GPRS attach procedure initiation

If the MS is in GMM state GMM-DEREGISTERED and in MM state MM IDLE, the MS initiates the combined GPRS attach procedure by sending an ATTACH REQUEST message to the network, starts timer T3310 and enters state GMM-REGISTERED-INITIATED and MM LOCATION UPDATING PENDING.

The MS shall include a valid P-TMSI, if available, the P-TMSI signature associated with the P-TMSI and the routing area identity associated with the P-TMSI in the ATTACH REQUEST message. If there is no valid P-TMSI available, the IMSI shall be included instead of the P-TMSI and P-TMSI signature. Furthermore the MS shall include the TMSI status IE if no valid TMSI is available.

In UMTS, if the MS wishes to prolong the established PS signalling connection after the GPRS attach, it may set a follow-on request pending indicator on.

#### 4.7.3.2.2 GMM Common procedure initiation

The network may initiate GMM common procedures, e.g. the GMM identification and GMM authentication and ciphering procedure, depending on the received information such as IMSI, CKSN, old RAI, P-TMSI and P-TMSI signature.

#### 4.7.3.2.3 Combined GPRS attach accepted by the network

Depending on the value of the attach result IE received in the ATTACH ACCEPT message, two different cases can be distinguished:

- Case 1) The attach result IE value indicates "combined GPRS attach": IMSI attach for GPRS and non-GPRS services have been successful.
- Case 2) The attach result IE value indicates "GPRS only": IMSI attach for GPRS services has been successful but IMSI attach for non-GPRS services has not been successful.

##### 4.7.3.2.3.1 Combined attach successful for GPRS and non-GPRS services

The description for IMSI attach for GPRS services as specified in section 4.7.3.1.3 shall be followed. In addition, the following description for IMSI attach for non-GPRS services applies.

The TMSI reallocation may be part of the combined GPRS attach procedure. The TMSI allocated is then included in the ATTACH ACCEPT message together with the location area identification (LAI). The network shall, in this case, change to state GMM-COMMON-PROCEDURE-INITIATED and shall start timer T3350 as described in section 4.7.6.

The MS, receiving an ATTACH ACCEPT message, stores the received location area identification, stops timer T3310, reset the location update attempt counter and sets the update status to U1 UPDATED. If the message contains an IMSI, the mobile station is not allocated any TMSI, and shall delete any TMSI accordingly. If the message contains a TMSI, the MS shall use this TMSI as the new temporary identity. The MS shall delete its old TMSI and shall store the new TMSI. In this case, an ATTACH COMPLETE message is returned to the network. If neither a TMSI nor an IMSI has been included by the network in the ATTACH ACCEPT message, the old TMSI, if any available, shall be kept. The new MM state is MM IDLE, the new GMM state is GMM-REGISTERED.

Any timer used for triggering the location update procedure (e.g T3211, T3212) shall be stopped if running.

The network receiving an ATTACH COMPLETE message stops timer T3350, changes to state GMM-REGISTERED and considers the new TMSI as valid.

##### 4.7.3.2.3.2 Combined attach successful for GPRS services only

The description for IMSI attach for GPRS services as specified in section 4.7.3.1.3 shall be followed. In addition, the following description for IMSI attach for non-GPRS services applies.

The MS receiving the ATTACH ACCEPT message takes one of the following actions depending on the reject cause:

- # 2 (IMSI unknown in HLR)



The MS shall set the update status to U3 ROAMING NOT ALLOWED and shall delete any TMSI, LAI and ciphering key sequence number. The new MM state is MM IDLE. The SIM shall be considered as invalid for non-GPRS services until switching off or the SIM is removed.

# 16 (MSC temporarily not reachable)

# 17 (Network failure); or

# 22 (Congestion)

The MS shall change to state GMM-REGISTERED.ATTEMPTING-TO-UPDATE-MM. Timer T3310 shall be stopped if still running. The routing area updating attempt counter shall be incremented.

If the routing area updating attempt counter is less than 5, and the stored RAI is equal to the RAI of the current serving cell and the GMM update status is equal to GU1 UPDATED:

- the MS shall keep the GMM update status GU1 UPDATED and changes state to GMM-REGISTERED.ATTEMPTING-TO-UPDATE-MM. The MS shall start timer T3311. When timer T3311 expires the combined routing area update procedure indicating "combined RA/LA updating with IMSI attach" is triggered again.

If the routing area updating attempt counter is greater than or equal to 5:

- the MS shall start timer T3302 and shall change to state GMM-REGISTERED.ATTEMPTING-TO-UPDATE-MM;
- a GPRS MS operating in MS operation mode A shall then proceed with appropriate MM specific procedure; a GPRS MS operating in MS operation mode B may then proceed with appropriate MM specific procedures. The MM sublayer shall act as in network operation mode II as long as the combined GMM procedures are not successful and no new RA is entered. The new MM state is IDLE.

Other values are considered as abnormal cases. The combined attach procedure shall be considered as failed for GPRS and non-GPRS services. The behaviour of the MS in those cases is specified in section 4.7.3.2.5.

#### 4.7.3.2.4 Combined GPRS attach not accepted by the network

If the attach request can neither be accepted by the network for GPRS nor for non-GPRS services, an ATTACH REJECT message is transferred to the MS. The MS receiving the ATTACH REJECT message stops timer T3310 and takes one of the following actions depending upon the reject cause:

# 3 (Illegal MS);

# 6 (Illegal ME); or

# 7 (GPRS services not allowed)

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number. The SIM shall be considered as invalid for GPRS services until switching off or the SIM is removed. The new GMM state is GMM-DEREGISTERED; the MM state is MM IDLE. A GPRS MS operating in MS operation mode A shall then perform an IMSI attach for non-GPRS services by use of the MM IMSI attach procedure; a GPRS MS operating in MS operation mode B shall then perform an IMSI attach for non-GPRS services by use of the MM IMSI attach procedure.

# 8 (GPRS services and non-GPRS services not allowed)

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (shall store it according to section 4.1.3.2) and shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number. The new GMM state is GMM-DEREGISTERED. The new MM state is MM IDLE.

The MS shall set the update status to U3 ROAMING NOT ALLOWED, shall delete any TMSI, LAI and ciphering key sequence number. The SIM shall be considered as invalid for GPRS and non-GPRS services until switching off or the SIM is removed.

# 11 (PLMN not allowed);

# 12 (Location area not allowed); ~~or~~

# 13 (Roaming not allowed in this location area); or

# 15 (No Suitable Cells In Location Area) ;:-

The MS shall delete any RAI, P-TMSI, P-TMSI signature and GPRS ciphering key sequence number stored, shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2), shall reset the routing area updating attempt counter and reset the GPRS attach attempt counter and changes to state GMM-DEREGISTERED. The MS shall set the update status to U3 ROAMING NOT ALLOWED, reset the location update attempt counter and shall delete any TMSI, LAI and ciphering key sequence number. The new MM state is MM IDLE.

The MS shall store the LAI or the PLMN identity in the appropriate forbidden list, i.e. in the "forbidden PLMN list" for cause #11, in the list of "forbidden location areas for regional provision of service" for cause #12, or in the list of "forbidden location areas for roaming" for cause #13 or #15. If cause #11 or #13 was received, the MS shall perform a PLMN selection instead of a cell selection. If cause #15 was received the MS shall search for a suitable cell in a different location area on the same PLMN.

# 14 (GPRS services not allowed in this PLMN)

The MS shall delete any RAI, P-TMSI, P-TMSI signature, and GPRS ciphering key sequence number stored, shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and shall change to state GMM-DEREGISTERED.

The MS shall store the PLMN identity in the "forbidden PLMNs for GPRS service" list.

A GPRS MS operating in MS operation mode A or B shall then perform an IMSI attach for non-GPRS services by use of the MM IMSI attach procedure.

Other values are considered as abnormal cases. The specification of the MS behaviour in those cases is specified in section 4.7.3.2.5.

#### 4.7.3.2.5 Abnormal cases in the MS

The abnormal cases specified in section 4.7.3.1.5 apply with the following modification:

If the GPRS attach attempt counter is less than 5, the MM state remains MM LOCATION UPDATING PENDING.

If the GPRS attach attempt counter is incremented according to section 4.7.3.1.5 the next actions depend on the Location Area Identities (stored on SIM and the one of the current serving cell) and the value of the attach attempt counter:

- if the update status is U1 UPDATED, and the stored LAI is equal to the one of the current serving cell and the attach attempt counter is smaller than 5, then the mobile station shall keep the update status to U1 UPDATED, the new MM state is MM IDLE substate NORMAL SERVICE; or
- if the update status is different from U1 UPDATED, or the stored LAI is different from the one of the current serving cell, or the attach attempt counter is greater or equal to 5, then the mobile station shall delete any LAI, TMSI, ciphering key sequence number stored in the SIM and set the update status to U2 NOT UPDATED. The new MM state is MM IDLE substate ATTEMPTING TO UPDATE.

#### 4.7.3.2.6 Abnormal cases on the network side

The abnormal cases specified in section 4.7.3.1.6 apply with the exceptions for cases a and c in which in addition to the P-TMSI and P-TMSI signature the old TMSI shall be considered occupied until the new TMSI is used by the MS in a subsequent message.

### 4.7.4 GPRS detach procedure

The GPRS detach procedure is used:

- to detach the IMSI for GPRS services only. Independent of the network operation mode, this procedure is used by all kind of GPRS MSs;

- as a combined GPRS detach procedure used by GPRS MSs operating in MS operation mode A or B to detach the IMSI for GPRS and non-GPRS services or for non-GPRS services only, if the network operates in network operation mode I; or
- in the case of a network failure condition to indicate to the MS that a re-attach with successive activation of previously active PDP contexts shall be performed.

After completion of a GPRS detach procedure or combined GPRS detach procedure for GPRS and non-GPRS services the GMM context is released.

The GPRS detach procedure shall be invoked by the MS if the MS is switched off, the SIM card is removed from the MS or if the GPRS or non-GPRS capability of the MS is disabled. The procedure may be invoked by the network to detach the IMSI for GPRS services. The GPRS detach procedure causes the MS to be marked as inactive in the network for GPRS services, non-GPRS services or both services.

In GSM, if the GPRS detach procedure is performed, the PDP contexts are deactivated locally without peer to peer signalling between the SM and LLC entities in the MS and the network.

In UMTS, if the GPRS detach procedure is performed, the PDP contexts are deactivated locally without peer to peer signalling between the SM entities in the MS and the network.

#### 4.7.4.1 MS initiated GPRS detach procedure

##### 4.7.4.1.1 MS initiated GPRS detach procedure initiation

The GPRS detach procedure is initiated by the MS by sending a DETACH REQUEST message. The detach type information element may indicate "GPRS detach with switching off", "GPRS detach without switching off", "IMSI detach", "GPRS/IMSI detach with switching off" or "GPRS/IMSI detach without switching off".

The MS shall include the P-TMSI in the DETACH REQUEST message. The MS shall also include a valid P-TMSI signature, if available.

If the MS is not switched off and the MS is in the state GMM\_REGISTERED, timer T3321 shall be started after the DETACH REQUEST message has been sent. If the detach type information element value indicates "IMSI Detach" the MS shall enter GMM-REGISTERED.IMSI-DETACH\_INITIATED, otherwise the MS shall enter the state GMM-DEREGISTERED-INITIATED. If the detach type information element value indicates "IMSI Detach" or "GPRS/IMSI Detach", state MM IMSI DETACH PENDING is entered. If the MS is to be switched off, the MS shall try for a period of 5 seconds to send the DETACH REQUEST message. If the MS is able to send the DETACH REQUEST message during this time the MS may be switched off.

If the detach type information element value indicates "GPRS detach without switching off" and the MS is attached for GPRS and non-GPRS services and the network operates in network operation mode I, then if in the MS the timer T3212 is not already running, the timer T3212 shall be set to its initial value and restarted after the DETACH REQUEST message has been sent.

##### 4.7.4.1.2 MS initiated GPRS detach procedure completion for GPRS services only

When the DETACH REQUEST message is received by the network, the network shall send a DETACH ACCEPT message to the MS, if the detach type IE value indicates that the detach request has not been sent due to switching off. If switching off was indicated, the procedure is completed when the network receives the DETACH REQUEST message. The network and the MS shall deactivate the PDP contexts and deactivate the logical link(s), if any.

The MS is marked as inactive in the network for GPRS services; state GMM-DEREGISTERED is entered in the MS and the network.

In UMTS, if the detach has been sent due to switching off, then the network shall release the resources in the lower layers for this MS (see 3GPP TS 25.331).

NOTE: When the DETACH REQUEST message is received by the network, and if the detach type IE value indicates that the detach is not due to power off, the authentication and ciphering procedure as well as the identification procedure may be performed.

#### 4.7.4.1.3 MS initiated combined GPRS detach procedure completion

When the DETACH REQUEST message is received by the network, a DETACH ACCEPT message shall be sent to the MS, if the detach type IE value indicates that the detach request has not been sent due to switching off. Depending on the value of the detach type IE the following applies:

GPRS/IMSI detach:

The MS is marked as inactive in the network for GPRS and for non-GPRS services. The network and the MS shall deactivate the PDP contexts and deactivate the logical link(s), if any. The States GMM-DEREGISTERED and MM NULL are entered in both the MS and the network.

In UMTS, if the detach has been sent due to switching off, then the network shall release the resources in the lower layers for this MS (see 3GPP TS 25.331).

IMSI detach:

The MS is marked as inactive in the network for non-GPRS services. State MM NULL is entered in the MS and the network.

#### 4.7.4.1.4 Abnormal cases in the MS

The following abnormal cases can be identified:

##### a) T3321 time-out

On the first expiry of the timer, the MS shall retransmit the DETACH REQUEST message and shall reset and restart timer T3321. This retransmission is repeated four times, i.e. on the fifth expiry of timer T3321, the GPRS detach procedure shall be aborted, the MS shall change to state:

- MM-NULL if "IMSI detach" was requested;
- GMM-REGISTERED.NORMAL-SERVICE if "IMSI Detach" was requested
- GMM-DEREGISTERED if "GPRS detach" was requested;
- GMM-DEREGISTERED and MM-NULL if "GPRS/IMSI" detach was requested.

##### b) Lower layer failure before reception of DETACH ACCEPT message

The detach procedure is aborted and the MS shall change to state:

- MM-NULL if "IMSI detach" was requested;
- GMM-REGISTERED.NORMAL-SERVICE if "IMSI Detach" was requested
- GMM-DEREGISTERED if "GPRS detach" was requested;
- GMM-DEREGISTERED and MM-NULL if "IMSI/GPRS" detach was requested.

##### c) Detach procedure collision

If the MS receives a DETACH REQUEST message before the MS initiated GPRS detach procedure has been completed, a DETACH ACCEPT message shall be sent to the network.

##### d) Detach and GMM common procedure collision

GPRS detach containing cause "power off":

- If the MS receives a message used in a GMM common procedure before the GPRS detach procedure has been completed, this message shall be ignored and the GPRS detach procedure shall continue.

GPRS detach containing other causes than "power off"

- If the MS receives a P-TMSI REALLOCATION COMMAND, a GMM STATUS, or a GMM INFORMATION message before the GPRS detach procedure has been completed, this message shall be ignored and the GPRS detach procedure shall continue.

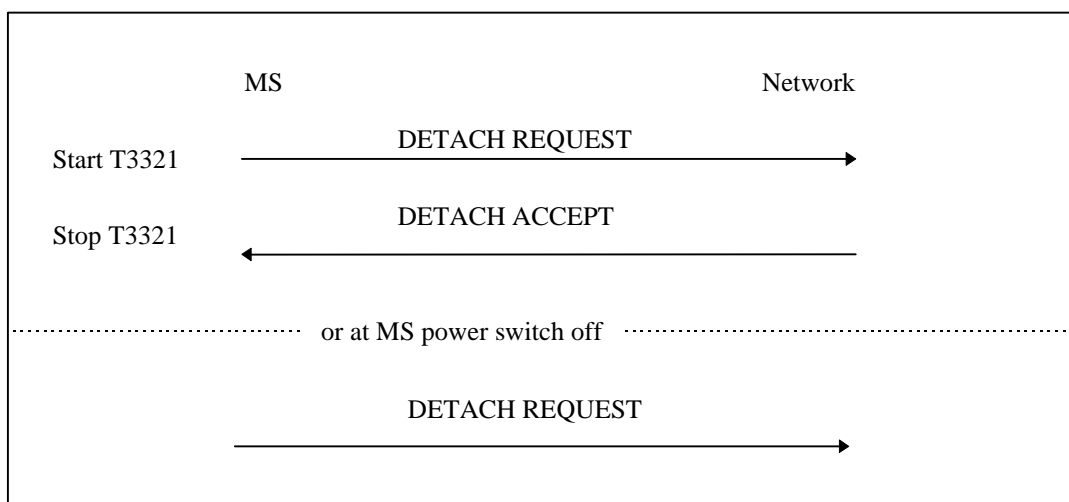
- If the MS receives an AUTHENTICATION AND CIPHERING REQUEST or IDENTITY REQUEST message, before the GPRS detach procedure has been completed, the MS shall respond to it as described in section 4.7.7 and 4.7.8 respectively.

e) Change of cell within the same RA (GSM only)

If a cell change occurs within the same RA before a DETACH ACCEPT message has been received, then the cell update procedure shall be performed before completion of the detach procedure.

f) Change of cell into a new routing area.

If a cell change into a new routing area occurs before a DETACH ACCEPT message has been received, the GPRS detach procedure shall be aborted and re-initiated after successfully performing a routing area updating procedure.



**Figure 4.7.4/1 3GPP TS 24.008: MS initiated GPRS detach procedure**

4.7.4.2 Network initiated GPRS detach procedure

4.7.4.2.1 Network initiated GPRS detach procedure initiation

The network initiates the GPRS detach procedure by sending a DETACH REQUEST message to the MS. The DETACH REQUEST message shall include a detach type IE. In addition, the network may include a cause IE to specify the reason for the detach request. The network shall start timer T3322. If the detach type IE indicates "re-attach not required" or "re-attach required", the network shall deactivate the PDP contexts and deactivate the logical link(s), if any, and shall change to state GMM-DEREGISTERED-INITIATED.

4.7.4.2.2 Network initiated GPRS detach procedure completion by the MS

When receiving the DETACH REQUEST message and the detach type IE indicates "re-attach not required" or "re-attach required", the MS shall deactivate the PDP contexts and deactivate the logical link(s), if any. The MS shall then send a DETACH ACCEPT message to the network and shall change state to GMM-DEREGISTERED. The MS shall, after the completion of the GPRS detach procedure, initiate a GPRS attach procedure if indicated by the network in the detach type IE.

A GPRS MS operating in MS operation mode A or B in network operation mode I, which receives an DETACH REQUEST message with detach type indicating "re-attach required" or "re-attach not required" and no cause code, is only detached for GPRS services in the network.

When receiving the DETACH REQUEST message and the detach type IE indicates "IMSI detach", the MS shall not deactivate the PDP contexts. The MS shall set the MM update status to U2 NOT UPDATED. A MS in operation mode A or B in network operation mode I may send a DETACH ACCEPT message to the network, and shall re-attach to non-GPRS service by performing the combined routing area updating procedure according to section 4.7.5.2, sending a ROUTING AREA UPDATE REQUEST message with Update type IE indicating "combined RA/LA updating with

IMSI attach". A MS in operation mode C, or in MS operation mode A or B in network operation mode II or III, shall send a DETACH ACCEPT message to the network.

If the detach type IE indicates "IMSI detach", or "re-attach required" then the MS shall ignore the cause code if received.

If the detach type information element value indicates "re-attach required" or "re-attach not required" and the MS is attached for GPRS and non-GPRS services and the network operates in network operation mode I, then if in the MS the timer T3212 is not already running, the timer T3212 shall be set to its initial value and restarted.

If the detach type IE indicates "re-attach required", the MS shall perform a new attach procedure. The MS should also activate PDP context(s) to replace any previously active PDP contexts.

NOTE: In some cases, user interaction may be required and then the MS cannot activate the PDP context(s) automatically.

If the detach type IE indicates "re-attach not required", then, depending on the received cause code, the MS shall act as follows:

# 2 (IMSI unknown in HLR)

The MS shall set the update status to U3 ROAMING NOT ALLOWED and shall delete any TMSI, LAI and ciphering key sequence number. The new MM state is MM IDLE. The SIM shall be considered as invalid for non-GPRS services until switching off or the SIM is removed.

A GPRS MS operating in MS operation mode A or B in network operation mode I, is still IMSI attached for GPRS services in the network.

# 3 (Illegal MS);

# 6 (Illegal ME);

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number. The new GMM state is GMM-DEREGISTERED. The SIM shall be considered as invalid for GPRS services until switching off or the SIM is removed.

A GPRS MS operating in MS operation mode A or B shall in addition set the update status to U3 ROAMING NOT ALLOWED, shall delete any TMSI, LAI and ciphering key sequence number. The new MM state is MM idle. The SIM shall be considered as invalid also for non-GPRS services until switching off or the SIM is removed.

# 7 (GPRS services not allowed);

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number. The SIM shall be considered as invalid for GPRS services until switching off or the SIM is removed. The new state is GMM-DEREGISTERED.

A GPRS MS operating in MS operation mode A or B in network operation mode I shall set the timer T3212 to its initial value and restart it, if it is not already running.

A GPRS MS operating in MS operation mode A or B in network operation mode I, is still IMSI attached for CS services in the network.

# 8 (GPRS services and non-GPRS services not allowed);

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED and the update status to U3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2). Furthermore, it shall delete any P-TMSI, P-TMSI signature, TMSI, RAI, LAI, ciphering key sequence number and GPRS ciphering key sequence number and shall consider the SIM as invalid for GPRS and non-GPRS services until switching off or the SIM is removed.

# 11 (PLMN not allowed);

# 12 (Location area not allowed);

# 13 (Roaming not allowed in this location area);<sup>5</sup> or

# 15 (No Suitable Cells In Location Area);

The MS shall delete any RAI or LAI, P-TMSI, P-TMSI signature and GPRS ciphering key sequence number, shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2).

A GPRS MS operating in MS operation mode A or B shall in addition set the update status to U3 ROAMING NOT ALLOWED and shall delete any TMSI, LAI and ciphering key sequence number. The new MM state is MM IDLE.

The MS shall store the LAI or the PLMN identity in the appropriate forbidden list, i.e. in the "forbidden PLMN list" for cause #11, in the list of "forbidden location areas for regional provision of service" for cause #12, or in the list of "forbidden location areas for roaming" for cause #13 and #15. If #11 or #13 was received, the MS shall perform a PLMN selection instead of a cell selection. If cause #15 was received the MS shall search for a suitable cell in a different location area on the same PLMN.

# 14 (GPRS services not allowed in this PLMN)

The MS shall delete any RAI, P-TMSI, P-TMSI signature, and GPRS ciphering key sequence number stored, shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and shall change to state GMM-DEREGISTERED.

The MS shall store the PLMN identity in the "forbidden PLMNs for GPRS service" list.

A GPRS MS operating in MS operation mode A or B in network operation mode I shall set the timer T3212 to its initial value and restart it, if it is not already running.

A GPRS MS operating in MS operation mode A or B, is still IMSI attached for CS services in the network.

Other cause values shall not impact the update status. Further actions of the MS are implementation dependent.

#### 4.7.4.2.3 Network initiated GPRS detach procedure completion by the network

The network shall, upon receipt of the DETACH ACCEPT message, stop timer T3322 and shall change state to GMM-DEREGISTERED.

#### 4.7.4.2.4 Abnormal cases on the network side

The following abnormal cases can be identified:

a) T3322 time-out

On the first expiry of the timer, the network shall retransmit the DETACH REQUEST message and shall start timer T3322. This retransmission is repeated four times, i.e. on the fifth expiry of timer T3322, the GPRS detach procedure shall be aborted and the network changes to state GMM-DEREGISTERED.

b) Low layer failure

The GPRS detach procedure is aborted and the network changes to state GMM-DEREGISTERED.

c) GPRS detach procedure collision

If the network receives a DETACH REQUEST message with "switching off" indicated, before the network initiated GPRS detach procedure has been completed, both procedures shall be considered completed.

If the network receives a DETACH REQUEST message without "switching off" indicated, before the network initiated GPRS detach procedure has been completed, the network shall send a DETACH ACCEPT message to the MS.

d) GPRS detach and GPRS attach procedure collision

If the network receives an ATTACH REQUEST message before the network initiated GPRS detach procedure with type of detach 're-attach not required' has been completed, the network shall ignore the ATTACH

REQUEST message. If the detach type IE value, sent in the DETACH REQUEST message, indicates "re-attach required" the detach procedure is aborted and the GPRS attach procedure shall be progressed after the PDP contexts have been deleted. If the detach type IE value, sent in the DETACH REQUEST message, indicates "IMSI detach" the detach procedure is aborted and the GPRS attach procedure shall be progressed.

e) GPRS detach and routing area updating procedure collision

GPRS detach containing detach type "re-attach required" or "re-attach not required":

If the network receives a ROUTING AREA UPDATE REQUEST message before the network initiated GPRS detach procedure has been completed, the detach procedure shall be progressed, i.e. the ROUTING AREA UPDATE REQUEST message shall be ignored.

GPRS detach containing detach type "IMSI detach":

If the network receives a ROUTING AREA UPDATE REQUEST message before the network initiated GPRS detach procedure has been completed, the network shall abort the detach procedure, shall stop T3322 and shall progress the routing area update procedure.

f) GPRS detach and service request procedure collision

If the network receives a SERVICE REQUEST message before the network initiated GPRS detach procedure has been completed, the network shall ignore the SERVICE REQUEST message.

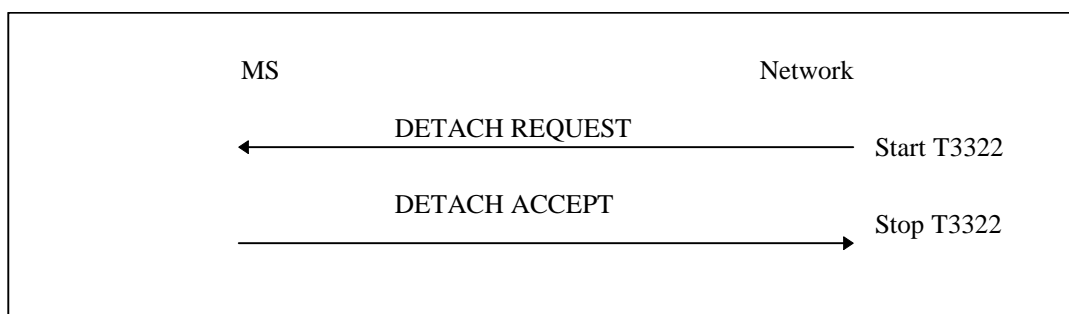


Figure 4.7.4/2 3GPP TS 24.008: Network initiated GPRS detach procedure

## 4.7.5 Routing area updating procedure

This procedure is used for:

- normal routing area updating to update the registration of the actual routing area of an MS in the network. This procedure is used by GPRS MSs in MS operation mode C and by GPRS MSs in MS operation modes A or B that are IMSI attached for GPRS and non-GPRS services if the network operates in network operation mode II or III;
- combined routing area updating to update the registration of the actual routing and location area of an MS in the network. This procedure is used by GPRS MSs in MS operation modes A or B that are IMSI attached for GPRS and non-GPRS services provided that the network operates in network operation mode I;
- periodic routing area updating. This procedure is used by GPRS MSs in MS operation mode C and by GPRS MSs in MS operation modes A or B that are IMSI attached for GPRS or for GPRS and non-GPRS services independent of the network operation mode;
- IMSI attach for non-GPRS services when the MS is IMSI attached for GPRS services. This procedure is used by GPRS MSs in MS operation modes A or B, if the network operates in network operation mode I.
- in GSM, resuming GPRS services when the RR sublayer indicated a resumption failure after dedicated mode was left, see GSM 04.18.
- in GSM, updating the network with the new MS Radio Access Capability IE when the content of the IE has changed. Normal or combined routing area updating procedure is used.
- UMTS to GSM and for GSM to UMTS intersystem change, see section 4.7.1.7. or



- in UMTS, to re-synchronize the PMM mode of MS and network after RRC connection release with cause "Directed signalling connection re-establishment", see Section 4.7.2.5.

Section 4.7.5.1 describes the routing area updating procedures for updating the routing area only. The combined routing area updating procedure used to update both the routing and location area is described in section 4.7.5.2.

The routing area updating procedure is always initiated by the MS. It is only invoked in state GMM-REGISTERED.

To limit the number of subsequently rejected routing area update attempts, a routing area updating attempt counter is introduced. The routing area updating attempt counter shall be incremented as specified in section 4.7.5.1.5. Depending on the value of the routing area updating attempt counter, specific actions shall be performed. The routing area updating attempt counter shall be reset when:

- a GPRS attach procedure is successfully completed; or
- a routing area updating procedure is successfully completed;

and additionally when the MS is in substate ATTEMPTING-TO-UPDATE:

- a new routing area is entered;
- expiry of timer T3302; or
- at request from registration function.

The mobile equipment shall contain a list of "forbidden location areas for roaming", as well as a list of "forbidden location areas for regional provision of service". The handling of these lists is described in section 4.4.1.

The Mobile Equipment shall contain a list of "equivalent PLMNs". The handling of this list is described in section 4.4.1.

In GSM, user data transmission in the MS shall be suspended during the routing area updating procedure; user data reception shall be possible. User data transmission in the network shall be suspended during the routing area updating procedure, if a new P-TMSI is assigned.

In UMTS, user data transmission and reception in the MS shall not be suspended during the routing area updating procedure. User data transmission in the network shall not be suspended during the routing area updating procedure.

In UMTS, when a ROUTING AREA UPDATE REQUEST is received by the SGSN over a new PS signalling connection while there is an ongoing PS signalling connection (network is already in mode PMM-CONNECTED) for this UE, the network shall progress the routing area update procedure as normal and release the previous PS signalling connection when the routing area update procedure has been accepted by the network.

Note: The re-establishment of the radio bearers of active PDP contexts is done as described in section "Service Request procedure".

#### 4.7.5.1 Normal and periodic routing area updating procedure

Periodic routing area updating is used to periodically notify the availability of the MS to the network. The value of the update type IE in the ROUTING AREA UPDATE REQUEST message shall indicate "periodic updating". The procedure is controlled in the MS by timer T3312. When timer T3312 expires, the periodic routing area updating procedure is started. Start and reset of timer T3312 is described in section 4.7.2.2.

In GSM, the normal routing area updating procedure is initiated when the MS detects a change of the routing area in state GMM-REGISTERED, or when the MS determines that GPRS resumption shall be performed, or when the MS needs to update the network with the new MS Radio Access Capability IE. The ROUTING AREA UPDATE REQUEST message shall always be the first data sent by the MS when a routing area border is crossed. The routing area identification is broadcast on the broadcast channel(s).

In UMTS, the normal routing area updating procedure is initiated when the MS detects a change of the routing area in state GMM-REGISTERED. The ROUTING AREA UPDATE REQUEST message shall always be the first GMM message sent by the MS when a routing area border is crossed.

A normal routing area updating shall abort any ongoing GMM procedure. Aborted GMM procedures may be repeated after the normal routing area updating procedure has been successfully performed. The value of the update type IE included in the message shall indicate "normal routing area updating".

#### 4.7.5.1.1 Normal and periodic routing area updating procedure initiation

To initiate the normal routing area updating procedure, the MS sends the message ROUTING AREA UPDATE REQUEST to the network, starts timer T3330 and changes to state GMM-ROUTING-AREA-UPDATING-INITIATED. The message ROUTING AREA UPDATE REQUEST shall contain the P-TMSI signature when received within a previous ATTACH ACCEPT or ROUTING AREA UPDATE ACCEPT message.

In UMTS, if the MS wishes to prolong the established PS signalling connection after the normal routing area updating procedure, it may set a follow-on request pending indicator on.

#### 4.7.5.1.2 GMM Common procedure initiation

The network may initiate GMM common procedures, e.g. the GMM authentication and ciphering procedure.

#### 4.7.5.1.3 Normal and periodic routing area updating procedure accepted by the network

If the routing area updating request has been accepted by the network, a ROUTING AREA UPDATE ACCEPT message shall be sent to the MS. The network may assign a new P-TMSI and/or a new P-TMSI signature for the MS. If a new P-TMSI and/or P-TMSI signature have been assigned to the MS, it/they shall be included in the ROUTING AREA UPDATE ACCEPT message together with the routing area identification.

In GSM the Cell Notification information element shall be included in the ROUTING AREA UPDATE ACCEPT message in order to indicate the ability of the network to support the Cell Notification.

The network shall change to state GMM-COMMON-PROCEDURE-INITIATED and shall start the supervision timer T3350 as described in section 4.7.6.

If the LAI or PLMN identity contained in the ROUTING AREA UPDATE ACCEPT message is a member of any of the "forbidden" lists then any such entry shall be deleted.

In UMTS, the network should prolong the PS signalling connection if the mobile station has indicated a follow-on request pending in ROUTING AREA UPDATE REQUEST. The network may also prolong the PS signalling connection without any indication from the mobile terminal.

If the PDP context status information element is included in ROUTING AREA UPDATE REQUEST message, then the network should deactivate all those PDP contexts locally (without peer to peer signalling between the MS and the network), which are not in SM state PDP-INACTIVE on network side but are indicated by the MS as being in state PDP-INACTIVE.

Upon receipt of a ROUTING AREA UPDATE ACCEPT message, the MS stores the received routing area identification, stops timer T3330, shall reset the routing area updating attempt counter and sets the GPRS update status to GU1 UPDATED. If the message contains a P-TMSI, the MS shall use this P-TMSI as new temporary identity for GPRS services and shall store the new P-TMSI. If no P-TMSI was included by the network in the ROUTING AREA UPDATING ACCEPT message, the old P-TMSI shall be kept. Furthermore, the MS shall store the P-TMSI signature if received in the ROUTING AREA UPDATING ACCEPT message. If no P-TMSI signature was included in the message, the old P-TMSI signature, if available, shall be deleted.

In GSM, if the ROUTING AREA UPDATE ACCEPT message contains the Cell Notification information element, then the MS shall start to use the LLC NULL frame to perform cell updates.

The network may also send a list of "equivalent PLMNs" in the ROUTING AREA UPDATE ACCEPT message. Each entry of the list contains a PLMN code (MCC+MNC). The mobile station shall store the list, as provided by the network, except that any PLMN code that is already in the "forbidden PLMN" list shall be removed from the "equivalent PLMNs" list before it is stored by the mobile station. In addition the mobile station shall add to the stored list the PLMN code of the network that sent the list. All PLMNs in the stored list shall be regarded as equivalent to each

other for PLMN selection, cell selection/re-selection and handover. The stored list in the mobile station shall be replaced on each occurrence of the ROUTING AREA UPDATE ACCEPT message. If no list is contained in the message, then the stored list in the mobile station shall be deleted. The list shall be stored in the mobile station while switched off so that it can be used for PLMN selection after switch on.

A ROUTING AREA UPDATE COMPLETE message shall be returned to the network if the ROUTING AREA UPDATE ACCEPT message contained:

- a P-TMSI; and/or
- Receive N-PDU Numbers (see 04.65 [78] and 3GPP TS 25.322).

In this case the Receive N-PDU Numbers values valid in the MS, shall be included in the ROUTING AREA UPDATE COMPLETE message.

NOTE: In UMTS, after a routing area updating procedure, the mobile station can initiate Service Request procedure to request the resource reservation for the active PDP contexts if the resources have been released by the network or send upper layer message (e.g. ACTIVATE PDP CONTEXT REQUEST) to the network via the existing PS signaling connection.

After that in UMTS, if the mobile station has indicated follow-on request pending and has a CM application request pending, it shall send an appropriate message (for example ACTIVATE PDP CONTEXT REQUEST) to the network.

#### 4.7.5.1.4 Normal and periodic routing area updating procedure not accepted by the network

If the routing area updating cannot be accepted, the network sends a ROUTING AREA UPDATE REJECT message to the MS. An MS that receives a ROUTING AREA UPDATE REJECT message, deletes the list of "equivalent PLMNs", and stops timer T3330. The MS shall then take different actions depending on the received reject cause value:

# 3 (Illegal MS);

# 6 (Illegal ME);

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and enter the state GMM-DEREGISTERED. Furthermore, it shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number and shall consider the SIM as invalid for GPRS services until switching off or the SIM is removed.

If the MS is IMSI attached via MM procedures, the MS shall in addition set the update status to U3 ROAMING NOT ALLOWED, shall delete any TMSI, LAI and ciphering key sequence number. The new MM state is MM IDLE. The SIM shall be considered as invalid also for non-GPRS services until switching off or the SIM is removed.

# 7 (GPRS services not allowed);

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2.9) and shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number. The SIM shall be considered as invalid for GPRS services until switching off or the SIM is removed. The new state is GMM-DEREGISTERED.

If the update type is "periodic updating" a GPRS MS operating in MS operation mode A or B in network operation mode I shall set the timer T3212 to its initial value and restart it, if it is not already running.

# 9 (MS identity cannot be derived by the network);

The MS shall set the GPRS update status to GU2 NOT UPDATED (and shall store it according to section 4.1.3.2), enter the state GMM-DEREGISTERED, and shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number. Subsequently, the MS may automatically initiate the GPRS attach procedure.

# 10 (Implicitly detached);

The MS shall change to state GMM-DEREGISTERED.NORMAL-SERVICE. The MS shall then perform a new attach procedure. The MS should also activate PDP context(s) to replace any previously active PDP contexts.

NOTE: In some cases, user interaction may be required and then the MS cannot activate the PDP context(s) automatically.

# 11 (PLMN not allowed);

# 12 (Location area not allowed);

# 13 (Roaming not allowed in this location area); or

# 15 (No Suitable Cells In Location Area);

- The MS shall delete any RAI, P-TMSI, P-TMSI signature and GPRS ciphering key sequence number, shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and enter the state GMM-DEREGISTERED.

If the MS is IMSI attached via MM procedures, the MS shall in addition set the update status to U3 ROAMING NOT ALLOWED and shall delete any TMSI, LAI and ciphering key sequence number and shall reset the location update attempt counter. The new MM state is MM IDLE.

The MS shall store the LAI or the PLMN identity in the appropriate forbidden list, i.e. in the "forbidden PLMN list" for cause #11, in the list of "forbidden location areas for regional provision of service" for cause #12, or in the list of "forbidden location areas for roaming" for cause #13 and #15. If #11 or #13 was received, the MS shall perform a PLMN selection instead of a cell selection. If cause #15 was received the MS shall search for a suitable cell in a different location area on the same PLMN.

# 14 (GPRS services not allowed in this PLMN)

The MS shall delete any RAI, P-TMSI, P-TMSI signature, and GPRS ciphering key sequence number stored, shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and shall change to state GMM-DEREGISTERED.

The MS shall store the PLMN identity in the "forbidden PLMNs for GPRS service" list. A GPRS MS operating in MS operation mode C shall perform a PLMN selection instead of a cell selection.

If the update type is "periodic updating" a GPRS MS operating in MS operation mode A or B in network operation mode I shall set the timer T3212 to its initial value and restart it, if it is not already running.

A GPRS MS operating in MS operation mode A or B in network operation mode II or III, is still IMSI attached for CS services in the network.

Other values are considered as abnormal cases. The specification of the MS behaviour in those cases is described in section 4.7.5.1.5.

#### 4.7.5.1.5 Abnormal cases in the MS

The following abnormal cases can be identified:

- a) Access barred because of access class control

The routing area updating procedure shall not be started. The MS stays in the current serving cell and applies the normal cell reselection process. The procedure is started as soon as possible and if still necessary, i.e. when the barred state is removed or because of a cell change.

- b) Lower layer failure before the ROUTING AREA UPDATE ACCEPT or ROUTING AREA UPDATE REJECT message is received

The procedure shall be aborted. The MS shall proceed as described below.

- c) T3330 time-out

The procedure is restarted four times, i.e. on the fifth expiry of timer T3330, the MS shall abort the procedure. The MS shall proceed as described below.

- d) ROUTING AREA UPDATE REJECT, other causes than those treated in section 4.7.5.1.4

The MS shall proceed as described below.

- e) If a routing area border is crossed, when the MS is in state GMM-ROUTING-AREA-UPDATE-INITIATED, the routing area updating procedure shall be aborted and re-initiated immediately. The MS shall set the GPRS update status to GU2 NOT UPDATED.
- f) In GSM, if a cell change occurs within the same RA, when the MS is in state GMM-ROUTING-AREA-UPDATE-INITIATED, the cell update procedure is performed, before completion of the routing area updating procedure.

g) Routing area updating and detach procedure collision

GPRS detach containing detach type "re-attach required" or "re-attach not required":

If the MS receives a DETACH REQUEST message before the routing area updating procedure has been completed, the routing area updating procedure shall be aborted and the GPRS detach procedure shall be progressed.

GPRS detach containing detach type "IMSI detach":

If the MS receives a DETACH REQUEST message before the routing area updating procedure has been completed, the routing area updating procedure shall be progressed, i.e. the DETACH REQUEST message shall be ignored.

h) Routing area updating and P-TMSI reallocation procedure collision

If the MS receives a P-TMSI REALLOCATION REQUEST message before the routing area updating procedure has been completed, the P-TMSI reallocation procedure shall be aborted and the routing area updating procedure shall be progressed.

In cases b, c and d the MS shall proceed as follows:

Timer T3330 shall be stopped if still running. The routing area updating attempt counter shall be incremented.

If the routing area updating attempt counter is less than 5, and the stored RAI is equal to the RAI of the current serving cell and the GMM update status is equal to GU1 UPDATED:

- the MS shall keep the GMM update status to GU1 UPDATED and changes state to GMM-REGISTERED.NORMAL-SERVICE. The MS shall start timer T3311. When timer T3311 expires the routing area updating procedure is triggered again.

If the routing area updating attempt counter is less than 5, and the stored RAI is different to the RAI of the current serving cell or the GMM update status is different to GU1 UPDATED:

- the MS shall start timer T3311, shall set the GPRS update status to GU2 NOT UPDATED and changes state to GMM-REGISTERED.ATTEMPTING-TO-UPDATE.
- If the routing area updating attempt counter is greater than or equal to 5:
- the MS shall start timer T3302, shall set the GPRS update status to GU2 NOT UPDATED and shall change to state GMM-REGISTERED.ATTEMPTING-TO-UPDATE or optionally to GMM-REGISTERED.PLMN-SEARCH(see 4.2.4.1.2).
- In UMTS, in case c the MS shall release the PS signaling connection and in case d the network shall release the PS signaling connection for this MS (see 3GPP TS 25.331).

#### 4.7.5.2.4 Combined routing area updating not accepted by the network

If the combined routing area updating cannot be accepted, the network sends a ROUTING AREA UPDATE REJECT message to the MS. An MS that receives a ROUTING AREA UPDATE REJECT message stops timer T3330 and enters state MM IDLE. The MS shall then take different actions depending on the received reject cause:

# 3 (Illegal MS);

# 6 (Illegal ME);

# 7 (GPRS services not allowed);

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number. The SIM shall be considered as invalid for GPRS services until switching off or the SIM is removed. The new state is GMM-DEREGISTERED. If in the MS the timer T3212 is not already running, the timer shall be set to its initial value and restarted.

A GPRS MS operating in MS operation mode A or B in network operation mode I, is still IMSI attached for CS services in the network and shall then proceed with the appropriate MM specific procedure according to the MM service state.

# 8 (GPRS services and non GPRS services not allowed);

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED and the update status to U3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and enter the state GMM-DEREGISTERED. Furthermore, it shall delete any P-TMSI, P-TMSI signature, TMSI, RAI, LAI, ciphering key sequence number and GPRS ciphering key sequence number and shall consider the SIM as invalid for GPRS and non GPRS services until switching off or the SIM is removed.

# 9 (MS identity cannot be derived by the network);

The MS shall set the GPRS update status to GU2 NOT UPDATED (and shall store it according to section 4.1.3.2), enter the state GMM-DEREGISTERED, and shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number. Subsequently, the MS may automatically initiate the GPRS attach procedure.

A GPRS MS operating in MS operation mode A or B in network operation mode I, is still IMSI attached for CS services in the network.

# 10 (Implicitly detached);

A GPRS MS operating in MS operation mode A or B in network operation mode I, is IMSI detached for both GPRS and CS services in the network.

The MS shall change to state GMM-DEREGISTERED.NORMAL-SERVICE. The MS shall then perform a new attach procedure. The MS should also activate PDP context(s) to replace any previously active PDP contexts.

NOTE: In some cases, user interaction may be required and then the MS cannot activate the PDP context(s) automatically.

# 11 (PLMN not allowed);

# 12 (Location area not allowed);

# 13 (Roaming not allowed in this location area); or

# 15 (No Suitable Cells In Location Area);

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED and the update status to U3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and enter the state GMM-DEREGISTERED. Furthermore, it shall delete any P-TMSI, P-TMSI signature, TMSI, RAI, LAI, ciphering key sequence number GPRS ciphering key sequence number, and reset the location update attempt counter.

The MS shall store the LAI or the PLMN identity in the appropriate forbidden list, i.e. in the "forbidden PLMN list" for cause #11, in the list of "forbidden location areas for regional provision of service" for cause #12, or in the list of "forbidden location areas for roaming" for cause #13 and #15. If #11 or #13 was received, the MS shall then perform a PLMN selection instead of a cell selection. If cause #15 was received the MS shall search for a suitable cell in a different location area on the same PLMN.

#### # 14 (GPRS services not allowed in this PLMN)

The MS shall delete any RAI, P-TMSI, P-TMSI signature, and GPRS ciphering key sequence number stored, shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and shall change to state GMM-DEREGISTERED. If in the MS the timer T3212 is not already running, the timer shall be set to its initial value and restarted.

The MS shall store the PLMN identity in the "forbidden PLMNs for GPRS service" list.

A GPRS MS operating in MS operation mode A or B in network operation mode I, is still IMSI attached for CS services in the network and shall then proceed with the appropriate MM specific procedure according to the MM service state.

Other values are considered as abnormal cases. The specification of the MS behaviour in those cases is described in section 4.7.5.2.5.

#### 4.7.5.2.5 Abnormal cases in the MS

The abnormal cases specified in section 4.7.5.1.5 apply with the following modification:

If the GPRS routing area updating counter is less than 5, the MM state remains MM LOCATION UPDATING PENDING.

If the GPRS routing area updating attempt counter is incremented according to section 4.7.5.1.5 the next actions depend on the Location Area Identities (stored on SIM and the one of the current serving cell) and the value of the routing area updating attempt counter.

- if the update status is U1 UPDATED, and the stored LAI is equal to the one of the current serving cell and the routing area updating attempt counter is smaller than 5, then the mobile station shall keep the update status to U1 UPDATED, the new MM state is MM IDLE substate NORMAL SERVICE, or
- if the update status is different from U1 UPDATED, or the stored LAI is different from the one of the current serving cell, or the routing area updating attempt counter is greater or equal to 5, the mobile station shall delete any LAI, TMSI, ciphering key sequence number stored in the SIM and set the update status to U2 NOT UPDATED. The new MM state is MM IDLE substate ATTEMPTING TO UPDATE.

#### 4.7.5.2.6 Abnormal cases on the network side

The abnormal cases specified in section 4.7.5.1.6 apply with the exceptions for cases a and c in which in addition to the P-TMSI and P-TMSI signature the old TMSI shall be considered occupied until the new TMSI is used by the MS in a subsequent message.

#### 4.7.13.4 Service request procedure not accepted by the network

- If the Service request cannot be accepted, the network returns a SERVICE REJECT message to the mobile station. An MS that receives a SERVICE REJECT message stops timer T3317. The MS shall then take different actions depending on the received reject cause value:

# 3 (Illegal MS);

# 6 (Illegal ME);

- The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and enter the state GMM-DEREGISTERED. Furthermore, it shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number and shall consider the SIM as invalid for GPRS services until switching off or the SIM is removed.

- A GPRS MS operating in MS operation mode A shall in addition set the update status to U3 ROAMING NOT ALLOWED, shall delete any TMSI, LAI and ciphering key sequence number. The new MM state is MM IDLE. The SIM shall be considered as invalid also for non-GPRS services until switching off or the SIM is removed.

# 7 (GPRS services not allowed);

- The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2.9) and shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number. The SIM shall be considered as invalid for GPRS services until switching off or the SIM is removed. The new state is GMM-DEREGISTERED.

# 9 (MS identity cannot be derived by the network);

- The MS shall set the GPRS update status to GU2 NOT UPDATED (and shall store it according to section 4.1.3.2), enter the state GMM-DEREGISTERED, and shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number. Subsequently, the MS may automatically initiate the GPRS attach procedure.

# 10 (Implicitly detached);

- The MS shall change to state GMM-DEREGISTERED.NORMAL-SERVICE. The MS shall then perform a new attach procedure. The MS should also activate PDP context(s) to replace any previously active PDP contexts.

NOTE: In some cases, user interaction may be required and then the MS cannot activate the PDP context(s) automatically.

# 11 (PLMN not allowed);

# 12 (Location area not allowed);

# 13 (Roaming not allowed in this location area); or

# 15 (No Suitable Cells In Location Area);

- The MS shall delete any RAI, P-TMSI, P-TMSI signature and GPRS ciphering key sequence number, shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and enter the state GMM-DEREGISTERED.
- A GPRS MS operating in MS operation mode A shall in addition set the update status to U3 ROAMING NOT ALLOWED and shall delete any TMSI, LAI and ciphering key sequence number. The new MM state is MM IDLE.
- The MS shall store the LAI or the PLMN identity in the appropriate forbidden list, i.e. in the "forbidden PLMN list" for cause #11, in the list of "forbidden location areas for regional provision of service" for cause #12, or in the list of "forbidden location areas for roaming" for cause #13 and #15. If #11 or #13 was received, the MS shall perform a PLMN selection instead of a cell selection. If cause #15 was received the MS shall search for a suitable cell in a different location area on the same PLMN.



# 40 (No PDP context activated)

- The MS shall deactivate locally all active PDP contexts and the MS shall enter the state GMM-REGISTERED.NORMAL-SERVICE. The MS may also activate PDP context(s) to replace any previously active PDP contexts.

NOTE: In some cases, user interaction may be required and then the MS cannot activate the PDP context(s) automatically.

Other values are considered as abnormal cases. The specification of the MS behaviour in those cases is described in section 4.7.13.5.

#### 4.7.13.5 Abnormal cases in the MS

The following abnormal cases can be identified:

- a) Access barred because of access class control

The Service request procedure shall not be started. The MS stays in the current serving cell and applies normal cell reselection process. The Service request procedure may be started by CM layer if it is still necessary, i.e. when access is granted or because of a cell change.

- b) Lower layer failure before the security mode control procedure is completed, SERVICE ACCEPT or SERVICE REJECT message is received

The procedure shall be aborted.

- c) T3317 expired

The MS shall enter GMM-REGISTERED state.

If the MS is in PMM-IDLE mode then the procedure shall be aborted and the MS shall initiate a PS signalling connection release.

If the MS is in PMM-CONNECTED mode, then the procedure shall be aborted.

- d) SERVICE REJECT received other causes than those treated in section 4.7.x.4

The procedure shall be aborted.

- e) Routing area update procedure is triggered

If a cell change into a new routing area occurs and the necessity of routing area update procedure is determined before the security mode control procedure is completed, a SERVICE ACCEPT or SERVICE REJECT message has been received, the Service request procedure shall be aborted and the routing area updating procedure is started immediately. Follow-on request pending may be indicated in the ROUTING AREA UPDATE REQUEST for the service, which was the trigger of the aborted Service request procedure, to restart the pending service itself or the Service Request procedure after the completion of the routing area updating procedure. If the service type of the aborted SERVICE REQUEST was indicating "data", then the routing area update procedure may be followed by a re-initiated Service request procedure indicating "data", if it is still necessary.

- f) Power off

If the MS is in state GMM-SERVICE-REQUEST-INITIATED at power off, the GPRS detach procedure shall be performed.

- g) Procedure collision

If the MS receives a DETACH REQUEST message from the network in state GMM-SERVICE-REQUEST-INITIATED, the GPRS detach procedure shall be progressed and the Service request procedure shall be aborted. If the cause IE, in the DETACH REQUEST message, indicated a "reattach request", the GPRS attach procedure shall be performed.

#### 4.7.13.6 Abnormal cases on the network side

The following abnormal cases can be identified:

a) Lower layer failure

If a low layer failure occurs before the security mode control procedure is completed, a SERVICE ACCEPT or SERVICE REJECT message has been sent to the MS, the network enters/stays in PMM-IDLE.

b) Protocol error

If the SERVICE REQUEST message is received with a protocol error, the network shall return a SERVICE REJECT message with one of the following reject causes:

#96: Mandatory information element error;

#99: Information element non-existent or not implemented;

#100: Conditional IE error;

#111: Protocol error, unspecified.

The network stays in PMM-IDLE mode.

c.) More than one SERVICE REQUEST received and the procedure has not been completed (i.e., the security mode control procedure has not been completed or SERVICE ACCEPT, SERVICE REJECT message has not been sent),

- If one or more of the information elements in the SERVICE REQUEST message differs from the ones received within the previous SERVICE REQUEST message, the previously initiated Service request procedure shall be aborted and the new Service request procedure shall be progressed ;

- If the information elements do not differ, then the network shall continue with the previous Service request procedure and shall not treat any further this SERVICE REQUEST message.

d) ATTACH REQUEST received before the security mode control procedure has been completed or an SERVICE ACCEPT or an SERVICE REJECT message has been sent.

If an ATTACH REQUEST message is received and the security mode control procedure has not been completed or an SERVICE ACCEPT or an SERVICE REJECT message has not been sent, the network may initiate the GMM common procedures, e.g. the GMM authentication and ciphering procedure. The network may e.g. after a successful GMM authentication and ciphering procedure execution, abort the Service request procedure, the GMM context and PDP contexts, if any, are deleted and the new ATTACH REQUEST is progressed.

e) ROUTING AREA UPDATE REQUEST message received before the security mode control procedure has been completed or an SERVICE ACCEPT or an SERVICE REJECT message has been sent

If an ROUTING AREA UPDATE REQUEST message is received and the security mode control procedure has not been completed or an SERVICE ACCEPT or an SERVICE REJECT message has not been sent, the network may initiate the GMM common procedures, e.g. the GMM authentication and ciphering procedure. The network may e.g. after a successful GMM authentication and ciphering procedure execution, abort the Service request procedure and progress the routing area update procedure.

f) If the Service Type indicates 'data' and the network fails to re-establish some or all RAB(s) then the SGSN may determine if PDP Context Modification or PDP Context Deactivation should be initiated.

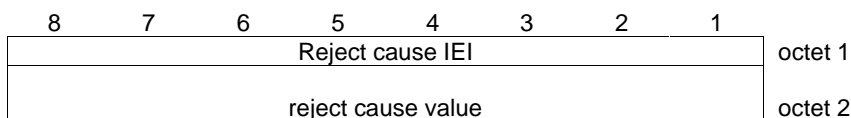
The appropriate action depends on the QoS profile of the PDP Context and is an operator choice.

### 10.5.3.6 Reject cause

The purpose of the *Reject Cause* information element is to indicate the reason why a request from the mobile station is rejected by the network.

The *Reject Cause* information element is coded as shown in figure 10.5.81/3GPP TS 24.008 and table 10.5.95/3GPP TS 24.008.

The *Reject Cause* is a type 3 information element with 2 octets length.



**Figure 10.5.81/3GPP TS 24.008 *Reject Cause* information element**

**Table 10.5.95/3GPP TS 24.008: *Reject Cause* information element**

Reject cause value (octet 2)								
Bits								
8	7	6	5	4	3	2	1	
0	0	0	0	0	0	1	0	IMSI unknown in HLR
0	0	0	0	0	0	1	1	Illegal MS
0	0	0	0	0	1	0	0	IMSI unknown in VLR
0	0	0	0	0	1	0	1	IMEI not accepted
0	0	0	0	0	1	1	0	Illegal ME
0	0	0	0	1	0	1	1	PLMN not allowed
0	0	0	0	1	1	0	0	Location Area not allowed
0	0	0	0	1	1	0	1	Roaming not allowed in this location area
<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>No Suitable Cells In Location Area</u>
0	0	0	1	0	0	0	1	Network failure
0	0	0	1	0	1	0	0	MAC failure
0	0	0	1	0	1	0	1	Synch failure
0	0	0	1	0	1	1	0	Congestion
0	0	1	0	0	0	0	0	Service option not supported
0	0	1	0	0	0	0	1	Requested service option not subscribed
0	0	1	0	0	0	1	0	Service option temporarily out of order
0	0	1	0	0	1	1	0	Call cannot be identified
0	0	1	1	0	0	0	0	} } retry upon entry into a new cell
0	0	1	1	1	1	1	1	} } Semantically incorrect message
0	1	0	1	1	1	1	1	Invalid mandatory information
0	1	1	0	0	0	0	0	Message type non-existent or not implemented
0	1	1	0	0	0	1	0	Message type not compatible with the protocol state
0	1	1	0	0	0	1	1	Information element non-existent or not implemented
0	1	1	0	0	1	0	0	Conditional IE error
0	1	1	0	0	1	0	1	Message not compatible with the protocol state
0	1	1	0	1	1	1	1	Protocol error, unspecified

Any other value received by the mobile station shall be treated as 0010 0010, 'Service option temporarily out of order'. Any other value received by the network shall be treated as 0110 1111, 'Protocol error, unspecified'.

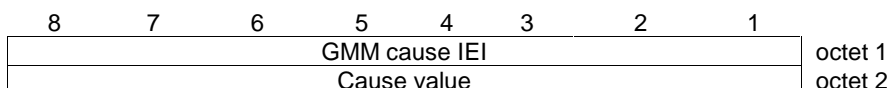
NOTE: The listed reject cause values are defined in Annex G.

### 10.5.5.14 GMM cause

The purpose of the GMM cause information element is to indicate the reason why a GMM request from the mobile station is rejected by the network.

The GMM cause information element is coded as shown in figure 10.5.129/3GPP TS 24.008 and table 10.5.147/3GPP TS 24.008.

The GMM cause is a type 3 information element with 2 octets length.



**Figure 10.5.129/3GPP TS 24.008: GMM cause information element**

**Table 10.5.147/3GPP TS 24.008: GMM cause information element**

Cause value (octet 2)								
Bits								
8	7	6	5	4	3	2	1	
0	0	0	0	0	0	1	0	IMSI unknown in HLR
0	0	0	0	0	0	1	1	Illegal MS
0	0	0	0	0	1	1	0	Illegal ME
0	0	0	0	0	1	1	1	GPRS services not allowed
0	0	0	0	1	0	0	0	GPRS services and non-GPRS services not allowed
0	0	0	0	1	0	0	1	MS identity cannot be derived by the network
0	0	0	0	1	0	1	0	Implicitly detached
0	0	0	0	1	0	1	1	PLMN not allowed
0	0	0	0	1	1	0	0	Location Area not allowed
0	0	0	0	1	1	0	1	Roaming not allowed in this location area
0	0	0	0	1	1	1	0	GPRS services not allowed in this PLMN
<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>No Suitable Cells In Location Area</u>
0	0	0	1	0	0	0	0	MSC temporarily not reachable
0	0	0	1	0	0	0	1	Network failure
0	0	0	1	0	1	0	0	MAC failure
0	0	0	1	0	1	0	1	Synch failure
0	0	0	1	0	1	1	0	Congestion
0	0	1	0	1	0	0	0	No PDP context activated
0	0	1	1	0	0	0	0	}
								} retry upon entry into a new cell
0	0	1	1	1	1	1	1	}
0	1	0	1	1	1	1	1	Semantically incorrect message
0	1	1	0	0	0	0	0	Invalid mandatory information
0	1	1	0	0	0	0	1	Message type non-existent or not implemented
0	1	1	0	0	0	1	0	Message type not compatible with the protocol state
0	1	1	0	0	0	1	1	Information element non-existent or not implemented
0	1	1	0	0	1	0	0	Conditional IE error
0	1	1	0	0	1	0	1	Message not compatible with the protocol state
0	1	1	0	1	1	1	1	Protocol error, unspecified

Any other value received by the mobile station shall be treated as 0110 1111, 'Protocol error, unspecified'. Any other value received by the network shall be treated as 0110 1111, 'Protocol error, unspecified'.

NOTE: The listed reject cause values are defined in Annex G.

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## Annex G (informative): UMTS specific cause values for mobility management

This annex is informative. It describes the cause values for the mobility management procedures for non-GPRS services (MM) and GPRS services (GMM). Sections G1 to G5 are valid for both MM and GMM. However, the following codes are applicable for non-GPRS services only:

#38 Call cannot be identified

Section G.6 applies only for GMM procedures.

---

### G.1 Causes related to MS identification

Cause value = 2 IMSI unknown in HLR

This cause is sent to the MS if the MS is not known (registered) in the HLR. This cause code does not affect operation of the GPRS service, although it may be used by a GMM procedure.

Cause value = 3 Illegal MS

This cause is sent to the MS when the network refuses service to the MS either because an identity of the MS is not acceptable to the network or because the MS does not pass the authentication check, i.e. the SRES received from the MS is different from that generated by the network.

Cause value = 4 IMSI unknown in VLR

This cause is sent to the MS when the given IMSI is not known at the VLR.

Cause value = 5 IMEI not accepted

This cause is sent to the MS if the network does not accept emergency call establishment using an IMEI.

Cause value = 6 Illegal ME

This cause is sent to the MS if the ME used is not acceptable to the network, e.g. blacklisted.

---

### G.2 Cause related to subscription options

Cause value = 11 PLMN not allowed

This cause is sent to the MS if it requests location updating in a PLMN where the MS, by subscription or due to operator determined barring is not allowed to operate.

Cause value = 12 Location Area not allowed

This cause is sent to the MS if it requests location updating in a location area where the MS, by subscription, is not allowed to operate.

Cause value = 13 Roaming not allowed in this location area

This cause is sent to an MS which requests location updating in a location area of a PLMN which offers roaming to that MS in that Location Area, by subscription.

Cause value = 15 No Suitable Cells In Location Area

This cause is sent to the MS if it requests location updating in a location area where the MS, by subscription, is not allowed to operate, but when it should find another allowed location area in the same PLMN.

Note : Cause #15 and cause #12 differ in the fact that cause #12 does not trigger the MS to search for another allowed location area on the same PLMN.

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## G.3 Causes related to PLMN specific network failures and congestion / Authentication Failures

Cause value = 20 MAC failure

This cause is sent to the network if the SIM detects that the MAC in the authentication request message is not fresh (see 3GPP TS 33.102)

Cause value = 21 Synch failure

This cause is sent to the network if the SIM detects that the SQN in the authentication request message is out of range (see 3GPP TS 33.102)

Cause value = 17 Network failure

This cause is sent to the MS if the MSC cannot service an MS generated request because of PLMN failures, e.g. problems in MAP.

Cause value = 22 Congestion

This cause is sent if the service request cannot be actioned because of congestion (e.g. no channel, facility busy/congested etc.)

---

## G.4 Causes related to nature of request

Cause value = 32 Service option not supported

This cause is sent when the MS requests a service/facility in the CM SERVICE REQUEST message which is not supported by the PLMN.

Cause value = 33 Requested service option not subscribed

This cause is sent when the MS requests a service option for which it has no subscription.

Cause value = 34 Service option temporarily out of order

This cause is sent when the MSC cannot service the request because of temporary outage of one or more functions required for supporting the service.

Cause value = 38 Call cannot be identified

This cause is sent when the network cannot identify the call associated with a call re-establishment request.

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## G.5 Causes related to invalid messages

Cause value = 95 Semantically incorrect message.

See annex H, section H.5.10.

Cause value = 96 Invalid mandatory information.

See annex H, section H.6.1.

Cause value = 97 Message type non-existent or not implemented.

See annex H, section H.6.2.

Cause value = 98 Message not compatible with protocol state.

See annex H, section H.6.3.

Cause value = 99 Information element non-existent or not implemented

See annex H, section H.6.4.

Cause value = 100 Conditional IE error.

See annex H, section H.6.5.

Cause value = 101 Message not compatible with protocol state

See annex H, section H.6.6.

Cause value = 111 Protocol error, unspecified

See annex H, section H.6.8.

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## G.6 Additional cause codes for GMM

Cause value = 7 GPRS services not allowed

This cause is sent to the MS if it requests an IMSI attach for GPRS services, but is not allowed to operate GPRS services.

Cause value = 8 GPRS services and non-GPRS services not allowed

This cause is sent to the MS if it requests a combined IMSI attach for GPRS and non-GPRS services, but is not allowed to operate either of them.

Cause value = 9 MS identity cannot be derived by the network

This cause is sent to the MS when the network cannot derive the MS's identity from the P-TMSI in case of inter-SGSN routing area update.

Cause value = 10 Implicitly detached

This cause is sent to the MS either if the network has implicitly detached the MS, e.g. some while after the Mobile reachable timer has expired, or if the GMM context data related to the subscription does not exist in the SGSN e.g. because of a SGSN restart.

Cause value = 14 GPRS services not allowed in this PLMN

This cause is sent to the MS which requests GPRS service in a PLMN which does not offer roaming for GPRS services to that MS.

Cause value = 16 MSC temporarily not reachable

This cause is sent to the MS if it requests a combined GPRS attach or routing area updating in a PLMN where the MSC is temporarily not reachable via the GPRS part of the GSM network.

Cause value = 40 No PDP context activated

This cause is sent to the MS if the MS requests an establishment of the radio access bearers for all active PDP contexts by sending a SERVICE REQUEST message indicating "data" to the network, but the SGSN does not have any active PDP context(s).

## CHANGE REQUEST

⌘ 24.008 CR 416 ⌘ rev 2 ⌘ Current version: 4.2.0 ⌘

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

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

**Title:** ⌘ Partial Roaming – restriction by location area

**Source:** ⌘ Hutchison3g

**Work item code:** ⌘ TEI

**Date:** ⌘ 27-04-01

**Category:** ⌘ A

**Release:** ⌘ REL-4

Use one of the following categories:

**F** (essential 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:** ⌘ Revision 2

Note added to annex G.2 to clarify difference between #12 and #15

Revision 1

Replaced word ‘another’ with ‘a’ in new text in all sections.

Replaced new cause value name with ‘No Suitable Cells In Location Area’

Removed some additional ‘or’ to comply with drafting rules

Added cross reference to 23.122 change requests on cover sheet

Revision 0

This was recognised as a potential problem in the UE Idle Mode Workshop in Helsinki earlier this year, but no changes have yet been proposed as companies have concentrated on other issues related to roaming, namely Equivalent PLMN codes and Idle Mode search procedures, which themselves were key changes to enable roaming in a 2G/3G environment.

This change reflects the agreement reached in the CN1/SA1 Network Selection Joint Ad Hoc meeting held on 8<sup>th</sup> May 2001 in Helsinki.

Partial roaming occurs when a mobile has access to a PLMN, but only to a limited set of location areas.

**Summary of change:** ⌘ The addition of ‘No Suitable Cells In Location Area’ is added to Location Update Reject and Routing Area Reject messages.

**Consequences if** ⌘ National and international roaming will not operate correctly when an operator



<b>not approved:</b>	uses a single PLMN code for both parts of network and partial or restricted roaming agreements are in place.		
<b>Clauses affected:</b>	⌘	4.4.4.5, 4.4.4.7, 4.7.3, 4.7.3.1.4, 4.7.3.2.4, 4.7.4.2.2, 4.7.5.1.4, 4.7.5.2.4, 4.7.13.4, 10.5.3.6, 10.5.5.14, Annex G.2	
<b>Other specs affected:</b>	⌘	<input checked="" type="checkbox"/> Other core specifications	⌘ 23.122
		<input type="checkbox"/> Test specifications	
		<input type="checkbox"/> O&M Specifications	
<b>Other comments:</b>	⌘		

#### How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at: [http://www.3gpp.org/3G\\_Specs/CRs.htm](http://www.3gpp.org/3G_Specs/CRs.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://www.3gpp.org/specs/> For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.

#### 4.4.4.5 Attempt Counter

To limit the number of location updating attempts made, where location updating is unsuccessful, an attempt counter is used. It counts the number of consecutive unsuccessful location update attempts.

The attempt counter is incremented when a location update procedure fails. The specific situations ~~is~~ are specified in section 4.4.4.9.

The attempt counter is reset when:

- the mobile station is powered on;
- a SIM is inserted;
- location update is successfully completed;
- location update completed with cause #11, #12, #13 or #13-15 (see section 4.4.4.7).

and in case of service state ATTEMPTING to UPDATE:

- a MS detects that a new location area is entered;
- expiry of timer T3212;
- location update is triggered by CM sublayer requests.

The attempt counter is used when deciding whether to re-attempt a location update after timeout of timer T3211.

#### 4.4.4.6 Location updating accepted by the network

If the location updating is accepted by the network a LOCATION UPDATING ACCEPT message is transferred to the mobile station.

In case the identity confidentiality service is active (see section 4.3.1 and 4.4.4.4), the TMSI reallocation may be part of the location updating procedure. The TMSI allocated is then contained in the LOCATION UPDATING ACCEPT message together with the location area identifier LAI. The network shall in this case start the supervision timer T3250 as described in section 4.3.1.

If the network wishes to prolong the RR connection to allow the mobile station to initiate MM connection establishment (for example if the mobile station has indicated in the LOCATION UPDATING REQUEST that it has a follow-on request pending) the network shall send "follow on proceed" in the LOCATION UPDATING ACCEPT and start timer T3255.

The mobile station receiving a LOCATION UPDATING ACCEPT message shall store the received location area identification LAI, stop timer T3210, reset the attempt counter and set the update status in the SIM to UPDATED. If the message contains an IMSI, the mobile station is not allocated any TMSI, and shall delete any TMSI in the SIM accordingly. If the message contains a TMSI, the mobile station is allocated this TMSI, and shall store this TMSI in the SIM and a TMSI REALLOCATION COMPLETE shall be returned to the network. If neither IMSI nor TMSI is received in the LOCATION UPDATING ACCEPT message, the old TMSI if any available shall be kept.

If the LAI or PLMN identity contained in the LOCATION UPDATING ACCEPT message is a member of any of the "forbidden lists" then any such entries shall be deleted.

The network may also send a list of "equivalent PLMNs" in the LOCATION UPDATING ACCEPT message. Each entry of the list contains a PLMN code (MCC+MNC). The mobile station shall store the list, as provided by the network, except that any PLMN code that is already in the "forbidden PLMN list" shall be removed from the "equivalent PLMNs" list before it is stored by the mobile station. In addition the mobile station shall add to the stored list the PLMN code of the network that sent the list. All PLMNs in the stored list shall be regarded as equivalent to each other for PLMN selection, cell selection/re-selection and handover. The stored list in the mobile station shall be replaced on each occurrence of the LOCATION UPDATING ACCEPT message. If no list is contained in the message, then the stored list in the mobile station shall be deleted. The list shall be stored in the mobile station while switched off so that it can be used for PLMN selection after switch on.

After that, the mobile station shall act according to the presence of the "Follow-on proceed" information element in the LOCATION UPDATING ACCEPT; if this element is present and the mobile station has a CM application request pending, it shall send a CM SERVICE REQUEST to the network and proceed as in section 4.5.1.1. Otherwise, it shall start timer T3240 and enter state WAIT FOR NETWORK COMMAND.

Furthermore, the network may grant authorisation for the mobile station to use GSM-Cordless Telephony System (CTS) in the Location Area and its immediate neighbourhood. The mobile should memorise this permission in non-volatile memory. If the "CTS permission" IE is not present in the message, the mobile is not authorised to use GSM-CTS, and shall accordingly delete any memorised permission.

NOTE: the interaction between CTS and GPRS procedures are not yet defined.

#### 4.4.4.7 Location updating not accepted by the network

If the location updating cannot be accepted the network sends a LOCATION UPDATING REJECT message to the mobile station. The mobile station receiving a LOCATION UPDATING REJECT message shall stop the timer T3210, store the reject cause, delete the list of "equivalent PLMNs", start T3240, enter state LOCATION UPDATING REJECTED await the release of the RR connection triggered by the network. Upon the release of the RR connection the mobile station shall take the following actions depending on the stored reject cause:

# 2: IMSI unknown in HLR;

# 3: Illegal MS; or

# 6: Illegal ME.

The mobile station shall set the update status to ROAMING NOT ALLOWED (and store it in the SIM according to section 4.1.2.2), and delete any TMSI, stored LAI and ciphering key sequence number and shall consider the SIM as invalid until switch-off or the SIM is removed.

# 11: PLMN not allowed;

# 12: Location Area not allowed; or

# 13: Roaming not allowed in this location area; or

# 15: No Suitable Cells In Location Area-

The mobile station shall delete any LAI, TMSI and ciphering key sequence number stored in the SIM, reset the attempt counter, set the update status to ROAMING NOT ALLOWED (and store it in the SIM according to section 4.1.2.2). The mobile station shall store the LAI or the PLMN identity in the suitable forbidden list, i.e. in the "forbidden PLMN list" for cause #11, in the list of "forbidden location areas for regional provision of service" for cause #12, and in the list of "forbidden location areas for roaming" for cause #13 and #15. In addition, the MS ~~will~~ shall memorize if cause #13 was received, so to perform a PLMN selection instead of a cell selection when back to the MM IDLE state. The MS shall search for a suitable cell in another location area in the same PLMN if cause #15 is received.

Other values are considered as abnormal cases and the specification of the mobile station behaviour in those cases is given in section 4.4.4.9.

### 4.7.3 GPRS attach procedure

The GPRS attach procedure is used for two purposes:

- normal GPRS attach, performed by the MS to IMSI attach for GPRS services only. The normal GPRS attach procedure shall be used by GPRS MSs in MS operation mode C, independent of the network operation mode. It shall also be used by GPRS MSs in MS operation modes A or B if the network operates in network operation mode II or III .
- combined GPRS attach procedure, used by GPRS MSs in MS operation modes A or B to attach the IMSI for GPRS and non-GPRS services provided that the network operates in network operation mode I.

With a successful GPRS attach procedure a GMM context is established.

Section 4.7.3.1 describes the GPRS attach procedure to attach the IMSI only for GPRS services. The combined GPRS attach procedure used to attach the IMSI for both GPRS and non-GPRS services is described in section 4.7.3.2.

If an IMSI attach for non-GPRS services is requested and a GMM context exists, the routing area updating procedure shall be used as described in section 4.7.5.2.

To limit the number of subsequently rejected attach attempts, a GPRS attach attempt counter is introduced. The GPRS attach attempt counter shall be incremented as specified in section 4.7.3.1.5. Depending on the value of the GPRS attach attempt counter, specific actions shall be performed. The GPRS attach attempt counter shall be reset when:

- the MS is powered on;
- a SIM is inserted;
- a GPRS attach procedure is successfully completed; or
- a combined GPRS attach procedure is completed for GPRS services only with cause #2, #16, #17 or #22
- a GPRS attach procedure is completed with cause #11, #12, #13 or #1513,

and additionally when the MS is in substate ATTEMPTING-TO-ATTACH:

- expiry of timer T3302;
- a new routing area is entered; or
- an attach is triggered by CM sublayer requests.

The mobile equipment shall contain a list of "forbidden location areas for roaming", as well as a list of "forbidden location areas for regional provision of service". The handling of these lists is described in section 4.4.1; the same lists are used by GMM and MM procedures.

The Mobile Equipment shall contain a list of "equivalent PLMNs". The handling of this list is described in section 4.4.1, the same list is used by GMM and MM procedures.

#### 4.7.3.1 GPRS attach procedure for GPRS services

The GPRS attach procedure is a GMM procedure used by GPRS MSs to IMSI attach for GPRS services.

The attach type information element shall indicate "GPRS attach".

##### 4.7.3.1.1 GPRS attach procedure initiation

In state GMM-DEREGISTERED, the MS initiates the GPRS attach procedure by sending an ATTACH REQUEST message to the network, starts timer T3310 and enters state GMM-REGISTERED-INITIATED.

The MS capable both UMTS and GSM or only GSM system shall include a valid P-TMSI, if any is available, the P-TMSI signature associated with the P-TMSI and the routing area identity associated with the P-TMSI in the ATTACH

REQUEST message. If there is no valid P-TMSI available, the IMSI shall be included instead of the P-TMSI and P-TMSI signature.

The MS shall also indicate within the DRX parameters whether it supports the split pg cycle option on CCCH. The optional support of the split pg cycle on CCCH by the network is indicated in SI13 or PSI1. Split pg cycle on CCCH is applied by both the network and the MS when the split pg cycle option is supported by both (see 3GPP TS 05.02).

In UMTS, if the MS wishes to prolong the established PS signalling connection after the GPRS attach procedure, it may set a follow-on request pending indicator on.

#### 4.7.3.1.2 GMM common procedure initiation

The network may initiate GMM common procedures, e.g. the GMM identification and GMM authentication and ciphering procedure, depending on the received information such as IMSI, CKSN, old RAI, P-TMSI and P-TMSI signature.

#### 4.7.3.1.3 GPRS attach accepted by the network

If the GPRS attach request is accepted by the network, an ATTACH ACCEPT message is sent to the MS.

The P-TMSI reallocation may be part of the GPRS attach procedure. The P-TMSI that shall be allocated is then included in the ATTACH ACCEPT message together with the routing area identifier. The network shall, in this case, change to state GMM-COMMON-PROCEDURE-INITIATED and shall start timer T3350 as described in section 4.7.6. Furthermore, the network may assign a P-TMSI signature for the GMM context which is then also included in the ATTACH ACCEPT message. If the LAI or PLMN identity that has been transmitted in the ATTACH ACCEPT message is a member of any of the "forbidden" lists, any such entry shall be deleted. Additionally, the network shall include the radio priority level to be used by the MS for mobile originated SMS transfer in the ATTACH ACCEPT message.

In GSM, the Cell Notification information element shall be included in the ATTACH ACCEPT message by the network which indicates that the Cell Notification is supported by the network.

In UMTS, the network should prolong the PS signalling connection if the mobile station has indicated a follow-on request pending in ATTACH REQUEST. The network may also prolong the PS signalling connection without any indication from the mobile terminal.

The MS, receiving an ATTACH ACCEPT message, stores the received routing area identification, stops timer T3310, reset the GPRS attach attempt counter, reset the routing area updating attempt counter, enters state GMM-REGISTERED and sets the GPRS update status to GU1 UPDATED.

If the message contains a P-TMSI, the MS shall use this P-TMSI as the new temporary identity for GPRS services. In this case, an ATTACH COMPLETE message is returned to the network. The MS shall delete its old P-TMSI and shall store the new one. If no P-TMSI has been included by the network in the ATTACH ACCEPT message, the old P-TMSI, if any available, shall be kept.

If the message contains a P-TMSI signature, the MS shall use this P-TMSI signature as the new temporary signature for the GMM context. The MS shall delete its old P-TMSI signature, if any is available, and shall store the new one. If the message contains no P-TMSI signature, the old P-TMSI signature, if available, shall be deleted.

The network may also send a list of "equivalent PLMNs" in the ATTACH ACCEPT message. Each entry of the list contains a PLMN code (MCC+MNC). The mobile station shall store the list, as provided by the network, except that any PLMN code that is already in the "forbidden PLMN" list shall be removed from the "equivalent PLMNs" list before it is stored by the mobile station. In addition the mobile station shall add to the stored list the PLMN code of the network that sent the list. All PLMNs in the stored list shall be regarded as equivalent to each other for PLMN selection, cell selection/re-selection and handover. The stored list in the mobile station shall be replaced on each occurrence of the ATTACH ACCEPT message. If no list is contained in the message, then the stored list in the mobile station shall be deleted. The list shall be stored in the mobile station while switched off so that it can be used for PLMN selection after switch on.

After that in UMTS, if the mobile station has indicated follow-on request pending and has a CM application request pending, it shall send an appropriate message (for example ACTIVATE PDP CONTEXT REQUEST) to the network.

In GSM, if the ATTACH ACCEPT message contains the Cell Notification information element, then the MS shall start to use the LLC NULL frame to perform cell updates. The network receiving an ATTACH COMPLETE message stops

timer T3350, changes to GMM-REGISTERED state and considers the P-TMSI sent in the ATTACH ACCEPT message as valid.

#### 4.7.3.1.4 GPRS attach not accepted by the network

If the attach request cannot be accepted by the network, an ATTACH REJECT message is transferred to the MS. The MS receiving the ATTACH REJECT message, deletes the list of "equivalent PLMNs", stops timer T3310 and takes one of the following actions depending upon the reject cause:

# 3 (Illegal MS);

# 6 (Illegal ME);

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number. The new GMM state is GMM-DEREGISTERED. The SIM shall be considered as invalid for GPRS services until switching off or the SIM is removed.

If the MS is IMSI attached via MM procedures, the MS shall in addition set the update status to U3 ROAMING NOT ALLOWED, shall delete any TMSI, LAI and ciphering key sequence number. The new MM state is MM IDLE. The SIM shall be considered as invalid also for non-GPRS services until switching off or the SIM is removed.

# 7 (GPRS services not allowed);

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number. The SIM shall be considered as invalid for GPRS services until switching off or the SIM is removed. The new state is GMM-DEREGISTERED.

# 8 (GPRS services and non-GPRS services not allowed);

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (shall store it according to section 4.1.3.2) and shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number. The new GMM state is GMM-DEREGISTERED. The new MM state is MM IDLE.

The MS shall set the update status to U3 ROAMING NOT ALLOWED, shall delete any TMSI, LAI and ciphering key sequence number. The SIM shall be considered as invalid for GPRS and non-GPRS services until switching off or the SIM is removed.

# 11 (PLMN not allowed);

# 12 (Location area not allowed);

# 13 (Roaming not allowed in this location area); or

# 15: No Suitable Cells In Location Area:

The MS shall delete any RAI, P-TMSI, P-TMSI signature, and GPRS ciphering key sequence number stored, shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2), shall reset the GPRS attach attempt counter and shall change to state GMM-DEREGISTERED.

If the MS is IMSI attached via MM procedures, the MS shall in addition set the update status to U3 ROAMING NOT ALLOWED, shall delete any TMSI, LAI and ciphering key sequence number. and shall reset the location update attempt counter. The new MM state is MM IDLE.

The MS shall store the LAI or the PLMN identity in the appropriate forbidden list, i.e. in the "forbidden PLMN list" for cause #11, in the list of "forbidden location areas for regional provision of service" for cause #12 or in the list of "forbidden location areas for roaming" for cause #13 and #15. If cause #11 or #13 was received, the MS shall perform a PLMN selection instead of a cell selection. If cause #15 was received the MS shall search for a suitable cell in a different location area on the same PLMN

# 14 (GPRS services not allowed in this PLMN)

The MS shall delete any RAI, P-TMSI, P-TMSI signature, and GPRS ciphering key sequence number stored, shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and shall change to state GMM-DEREGISTERED.

The MS shall store the PLMN identity in the "forbidden PLMNs for GPRS service" list. A GPRS MS operating in MS operation mode C shall perform a PLMN selection instead of a cell selection.

A GPRS MS operating in MS operation mode A or B in network operation mode II or III, is still IMSI attached for CS services in the network.

Other values are considered as abnormal cases. The specification of the MS behaviour in those cases is specified in section 4.7.3.1.5.

#### 4.7.3.1.5 Abnormal cases in the MS

The following abnormal cases can be identified:

- a) Access barred because of access class control

The GPRS attach procedure shall not be started. The MS stays in the current serving cell and applies normal cell reselection process. The GPRS attach procedure is started as soon as possible, i.e. when access is granted or because of a cell change.

- b) Lower layer failure before the ATTACH ACCEPT or ATTACH REJECT message is received

The procedure shall be aborted. The MS shall proceed as described below.

- c) T3310 time-out

On the first expiry of the timer, the MS reset and restart timer T3310 and shall retransmit the ATTACH REQUEST message. This retransmission is repeated four times, i.e. on the fifth expiry of timer T3310, the GPRS attach procedure shall be aborted and the MS shall proceed as described below.

- d) ATTACH REJECT, other causes than those treated in section 4.7.3.1.4

The MS shall proceed as described below.

- e) Change of cell within the same RA (GSM only)

If a cell change occurs within the same RA when the MS is in state GMM-REGISTERED-INITIATED, then the cell update procedure shall be performed before completion of the attach procedure.

- f) Change of cell into a new routing area

If a cell change into a new routing area occurs before an ATTACH ACCEPT or ATTACH REJECT message has been received, the GPRS attach procedure shall be aborted and re-initiated immediately. If a routing area border is crossed when the ATTACH ACCEPT message is received but before an ATTACH COMPLETE message is sent, the GPRS attach procedure shall be aborted and the routing area updating procedure shall be initiated. If a P-TMSI was allocated during the GPRS attach procedure, this P-TMSI shall be used in the routing area updating procedure. If a P-TMSI signature was allocated together with the P-TMSI during the GPRS attach procedure, this P-TMSI signature shall be used in the routing area updating procedure.

- g) Mobile originated detach required

If the MS is in state GMM-REGISTERED-INITIATED, the GPRS attach procedure shall be aborted and the GPRS detach procedure shall be performed (see 4.7.4.1).

- h) Procedure collision

If the MS receives a DETACH REQUEST message from the network in state GMM-REGISTERED-INITIATED with type of detach re-attach not required, the GPRS detach procedure shall be progressed and the GPRS attach procedure shall be aborted. Otherwise the GPRS attach procedure shall be progressed and the DETACH REQUEST message shall be ignored.

In cases b, c and d the MS shall proceed as follows. Timer T3310 shall be stopped if still running. The GPRS attach attempt counter shall be incremented.

If the GPRS attach attempt counter is less than 5:

- timer T3311 is started and the state is changed to GMM-DEREGISTERED.ATTEMPTING-TO-ATTACH.

If the GPRS attach attempt counter is greater than or equal to 5:

- the MS shall delete any RAI, P-TMSI, P-TMSI signature, and GPRS ciphering key sequence number, shall set the GPRS update status to GU2 NOT UPDATED, shall start timer T3302. The state is changed to GMM-DEREGISTERED..ATTEMPTING-TO-ATTACH or optionally to GMM-DEREGISTERED.PLMN-SEARCH (see 4.2.4.1.2).
- In UMTS, in case c the MS shall release the PS signaling connection and in case d the network shall release the PS signaling connection for this MS (see 3GPP TS 25.331).

#### 4.7.3.1.6 Abnormal cases on the network side

The following abnormal cases can be identified:

##### a) Lower layer failure

If a low layer failure occurs before the message ATTACH COMPLETE has been received from the MS and a new P-TMSI (or a new P-TMSI and a new P-TMSI signature) has been assigned, the network shall consider both the old and new P-TMSI each with its corresponding P-TMSI-signature as valid until the old P-TMSI can be considered as invalid by the network (see section 4.7.1.5) and shall not resent the message ATTACH ACCEPT. During this period the network may:

- use the identification procedure followed by a P-TMSI reallocation procedure if the old P-TMSI is used by the MS in a subsequent message.

##### b) Protocol error

If the ATTACH REQUEST message is received with a protocol error, the network shall return an ATTACH REJECT message with one of the following reject causes:

- #96: Mandatory information element error;
- #99: Information element non-existent or not implemented;
- #100: Conditional IE error;
- #111: Protocol error, unspecified.

##### c) T3350 time-out

On the first expiry of the timer, the network shall retransmit the ATTACH ACCEPT message and shall reset and restart timer T3350.

This retransmission is repeated four times, i.e. on the fifth expiry of timer T3350, the GPRS attach procedure shall be aborted. If a new P-TMSI or a new P-TMSI together with a new P-TMSI signature were allocated in the ATTACH ACCEPT message, the network shall consider both the old and new P-TMSI each together with the corresponding P-TMSI signatures as valid until the old P-TMSI can be considered as invalid by the network (see section 4.7.1.5). During this period the network acts as specified for case a.

##### d.1) ATTACH REQUEST received

- If one or more of the information elements in the ATTACH REQUEST message differ from the ones received within the previous ATTACH REQUEST message, the previously initiated GPRS attach procedure shall be aborted and the new GPRS attach procedure shall be progressed, or
- If no information element differ, then the ATTACH ACCEPT message shall be resent.

##### d.2) More than one ATTACH REQUEST received and no ATTACH ACCEPT or ATTACH REJECT message has been sent



- If one or more of the information elements in the ATTACH REQUEST message differs from the ones received within the previous ATTACH REQUEST message, the previously initiated GPRS attach procedure shall be aborted and the new GPRS attach procedure shall be progressed;
- If the information elements do not differ, then the network shall continue with the previous attach procedure and shall not treat any further this ATTACH REQUEST message.

e) ATTACH REQUEST received in state GMM-REGISTERED

If an ATTACH REQUEST message is received in state GMM-REGISTERED the network may initiate the GMM common procedures; if it turned out that the ATTACH REQUEST message was send by an MS that has already been attached, the GMM context and PDP contexts, if any, are deleted and the new ATTACH REQUEST is progressed.

f) ROUTING AREA UPDATE REQUEST message received before ATTACH COMPLETE message.

Timer T3350 shall be stopped. The allocated P-TMSI shall be considered as valid and the routing area updating procedure shall be progressed as described in section 4.7.5.

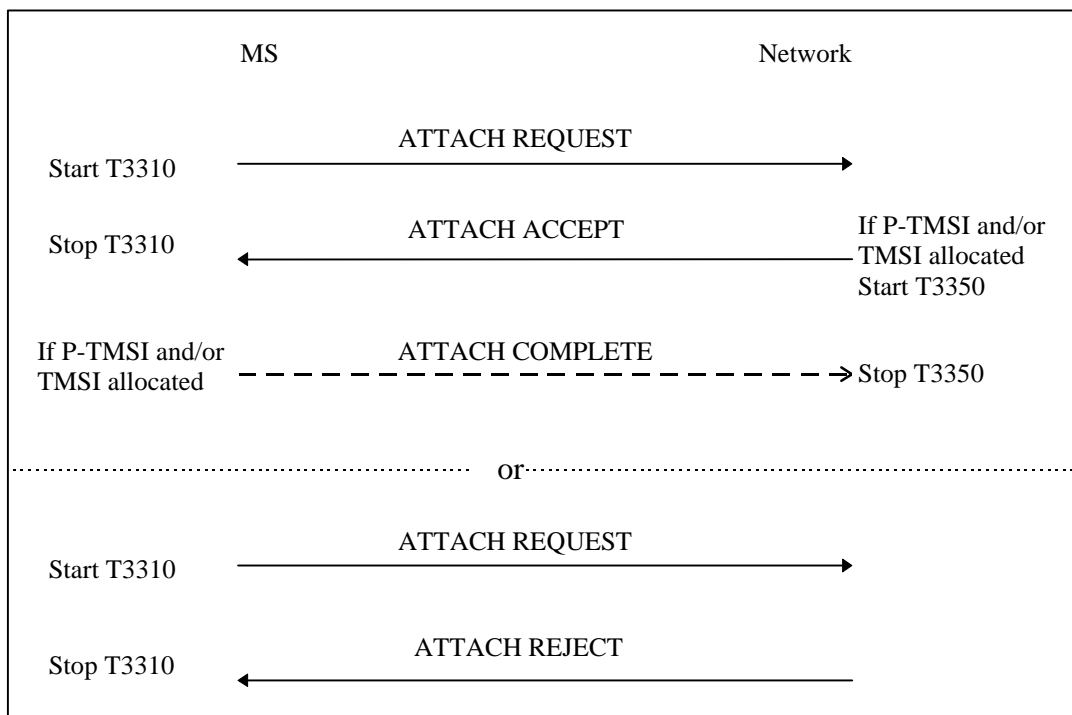


Figure 4.7.3/1 3GPP TS 24.008: GPRS attach procedure and combined GPRS attach procedure

### 4.7.3.2 Combined GPRS attach procedure for GPRS and non-GPRS services

The combined GPRS attach procedure is a GMM procedure used by a GPRS MS operating in MS operation modes A or B for IMSI attach for GPRS and non-GPRS services if the network operates in network operation mode I.

If a GPRS MS operating in MS operation modes A or B is already attached for non-GPRS services by use of the MM specific IMSI attach procedure, but additionally wishes to perform an IMSI attach for GPRS services, the combined GPRS attach procedure shall also be used.

The attach type information element shall indicate "combined GPRS attach". In this case, the messages ATTACH ACCEPT, ATTACH COMPLETE, and ATTACH REJECT used by the combined GPRS attach procedure carry information for both the GPRS and the non-GPRS services.

#### 4.7.3.2.1 Combined GPRS attach procedure initiation

If the MS is in GMM state GMM-DEREGISTERED and in MM state MM IDLE, the MS initiates the combined GPRS attach procedure by sending an ATTACH REQUEST message to the network, starts timer T3310 and enters state GMM-REGISTERED-INITIATED and MM LOCATION UPDATING PENDING.

The MS shall include a valid P-TMSI, if available, the P-TMSI signature associated with the P-TMSI and the routing area identity associated with the P-TMSI in the ATTACH REQUEST message. If there is no valid P-TMSI available, the IMSI shall be included instead of the P-TMSI and P-TMSI signature. Furthermore the MS shall include the TMSI status IE if no valid TMSI is available.

In UMTS, if the MS wishes to prolong the established PS signalling connection after the GPRS attach, it may set a follow-on request pending indicator on.

#### 4.7.3.2.2 GMM Common procedure initiation

The network may initiate GMM common procedures, e.g. the GMM identification and GMM authentication and ciphering procedure, depending on the received information such as IMSI, CKSN, old RAI, P-TMSI and P-TMSI signature.

#### 4.7.3.2.3 Combined GPRS attach accepted by the network

Depending on the value of the attach result IE received in the ATTACH ACCEPT message, two different cases can be distinguished:

- Case 1) The attach result IE value indicates "combined GPRS attach": IMSI attach for GPRS and non-GPRS services have been successful.
- Case 2) The attach result IE value indicates "GPRS only": IMSI attach for GPRS services has been successful but IMSI attach for non-GPRS services has not been successful.

##### 4.7.3.2.3.1 Combined attach successful for GPRS and non-GPRS services

The description for IMSI attach for GPRS services as specified in section 4.7.3.1.3 shall be followed. In addition, the following description for IMSI attach for non-GPRS services applies.

The TMSI reallocation may be part of the combined GPRS attach procedure. The TMSI allocated is then included in the ATTACH ACCEPT message together with the location area identification (LAI). The network shall, in this case, change to state GMM-COMMON-PROCEDURE-INITIATED and shall start timer T3350 as described in section 4.7.6.

The MS, receiving an ATTACH ACCEPT message, stores the received location area identification, stops timer T3310, reset the location update attempt counter and sets the update status to U1 UPDATED. If the message contains an IMSI, the mobile station is not allocated any TMSI, and shall delete any TMSI accordingly. If the message contains a TMSI, the MS shall use this TMSI as the new temporary identity. The MS shall delete its old TMSI and shall store the new TMSI. In this case, an ATTACH COMPLETE message is returned to the network. If neither a TMSI nor an IMSI has been included by the network in the ATTACH ACCEPT message, the old TMSI, if any available, shall be kept. The new MM state is MM IDLE, the new GMM state is GMM-REGISTERED.

Any timer used for triggering the location update procedure (e.g T3211, T3212) shall be stopped if running.

The network receiving an ATTACH COMPLETE message stops timer T3350, changes to state GMM-REGISTERED and considers the new TMSI as valid.

##### 4.7.3.2.3.2 Combined attach successful for GPRS services only

The description for IMSI attach for GPRS services as specified in section 4.7.3.1.3 shall be followed. In addition, the following description for IMSI attach for non-GPRS services applies.

The MS receiving the ATTACH ACCEPT message takes one of the following actions depending on the reject cause:

- # 2 (IMSI unknown in HLR)

The MS shall set the update status to U3 ROAMING NOT ALLOWED and shall delete any TMSI, LAI and ciphering key sequence number. The new MM state is MM IDLE. The SIM shall be considered as invalid for non-GPRS services until switching off or the SIM is removed.

# 16 (MSC temporarily not reachable)

# 17 (Network failure); or

# 22 (Congestion)

The MS shall change to state GMM-REGISTERED.ATTEMPTING-TO-UPDATE-MM. Timer T3310 shall be stopped if still running. The routing area updating attempt counter shall be incremented.

If the routing area updating attempt counter is less than 5, and the stored RAI is equal to the RAI of the current serving cell and the GMM update status is equal to GU1 UPDATED:

- the MS shall keep the GMM update status GU1 UPDATED and changes state to GMM-REGISTERED.ATTEMPTING-TO-UPDATE-MM. The MS shall start timer T3311. When timer T3311 expires the combined routing area update procedure indicating "combined RA/LA updating with IMSI attach" is triggered again.

If the routing area updating attempt counter is greater than or equal to 5:

- the MS shall start timer T3302 and shall change to state GMM-REGISTERED.ATTEMPTING-TO-UPDATE-MM;
- a GPRS MS operating in MS operation mode A shall then proceed with appropriate MM specific procedure; a GPRS MS operating in MS operation mode B may then proceed with appropriate MM specific procedures. The MM sublayer shall act as in network operation mode II as long as the combined GMM procedures are not successful and no new RA is entered. The new MM state is IDLE.

Other values are considered as abnormal cases. The combined attach procedure shall be considered as failed for GPRS and non-GPRS services. The behaviour of the MS in those cases is specified in section 4.7.3.2.5.

#### 4.7.3.2.4 Combined GPRS attach not accepted by the network

If the attach request can neither be accepted by the network for GPRS nor for non-GPRS services, an ATTACH REJECT message is transferred to the MS. The MS receiving the ATTACH REJECT message stops timer T3310 and takes one of the following actions depending upon the reject cause:

# 3 (Illegal MS);

# 6 (Illegal ME);

# 7 (GPRS services not allowed);

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number. The SIM shall be considered as invalid for GPRS services until switching off or the SIM is removed. The new GMM state is GMM-DEREGISTERED; the MM state is MM IDLE. A GPRS MS operating in MS operation mode A shall then perform an IMSI attach for non-GPRS services by use of the MM IMSI attach procedure; a GPRS MS operating in MS operation mode B shall then perform an IMSI attach for non-GPRS services by use of the MM IMSI attach procedure.

# 8 (GPRS services and non-GPRS services not allowed);

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (shall store it according to section 4.1.3.2) and shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number. The new GMM state is GMM-DEREGISTERED. The new MM state is MM IDLE.

The MS shall set the update status to U3 ROAMING NOT ALLOWED, shall delete any TMSI, LAI and ciphering key sequence number. The SIM shall be considered as invalid for GPRS and non-GPRS services until switching off or the SIM is removed.

# 11 (PLMN not allowed);

# 12 (Location area not allowed);

# 13 (Roaming not allowed in this location area); or

# 15 (No Suitable Cells In Location Area);

The MS shall delete any RAI, P-TMSI, P-TMSI signature and GPRS ciphering key sequence number stored, shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2), shall reset the routing area updating attempt counter and reset the GPRS attach attempt counter and changes to state GMM-DEREGISTERED. The MS shall set the update status to U3 ROAMING NOT ALLOWED, reset the location update attempt counter and shall delete any TMSI, LAI and ciphering key sequence number. The new MM state is MM IDLE.

The MS shall store the LAI or the PLMN identity in the appropriate forbidden list, i.e. in the "forbidden PLMN list" for cause #11, in the list of "forbidden location areas for regional provision of service" for cause #12 or in the list of "forbidden location areas for roaming" for cause #13 and #15. If cause #11 or #13 was received, the MS shall perform a PLMN selection instead of a cell selection. If cause #15 was received the MS shall search for a suitable cell in a different location area on the same PLMN

# 14 (GPRS services not allowed in this PLMN)

The MS shall delete any RAI, P-TMSI, P-TMSI signature, and GPRS ciphering key sequence number stored, shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and shall change to state GMM-DEREGISTERED.

The MS shall store the PLMN identity in the "forbidden PLMNs for GPRS service" list.

A GPRS MS operating in MS operation mode A or B shall then perform an IMSI attach for non-GPRS services by use of the MM IMSI attach procedure.

Other values are considered as abnormal cases. The specification of the MS behaviour in those cases is specified in section 4.7.3.2.5.

#### 4.7.3.2.5 Abnormal cases in the MS

The abnormal cases specified in section 4.7.3.1.5 apply with the following modification:

If the GPRS attach attempt counter is less than 5, the MM state remains MM LOCATION UPDATING PENDING.

If the GPRS attach attempt counter is incremented according to section 4.7.3.1.5 the next actions depend on the Location Area Identities (stored on SIM and the one of the current serving cell) and the value of the attach attempt counter:

- if the update status is U1 UPDATED, and the stored LAI is equal to the one of the current serving cell and the attach attempt counter is smaller than 5, then the mobile station shall keep the update status to U1 UPDATED, the new MM state is MM IDLE substate NORMAL SERVICE; or
- if the update status is different from U1 UPDATED, or the stored LAI is different from the one of the current serving cell, or the attach attempt counter is greater or equal to 5, then the mobile station shall delete any LAI, TMSI, ciphering key sequence number stored in the SIM and set the update status to U2 NOT UPDATED. The new MM state is MM IDLE substate ATTEMPTING TO UPDATE.

#### 4.7.3.2.6 Abnormal cases on the network side

The abnormal cases specified in section 4.7.3.1.6 apply with the exceptions for cases a and c in which in addition to the P-TMSI and P-TMSI signature the old TMSI shall be considered occupied until the new TMSI is used by the MS in a subsequent message.

### 4.7.4 GPRS detach procedure

The GPRS detach procedure is used:

- to detach the IMSI for GPRS services only. Independent of the network operation mode, this procedure is used by all kind of GPRS MSs;

- as a combined GPRS detach procedure used by GPRS MSs operating in MS operation mode A or B to detach the IMSI for GPRS and non-GPRS services or for non-GPRS services only, if the network operates in network operation mode I; or
- in the case of a network failure condition to indicate to the MS that a re-attach with successive activation of previously active PDP contexts shall be performed.

After completion of a GPRS detach procedure or combined GPRS detach procedure for GPRS and non-GPRS services the GMM context is released.

The GPRS detach procedure shall be invoked by the MS if the MS is switched off, the SIM card is removed from the MS or if the GPRS or non-GPRS capability of the MS is disabled. The procedure may be invoked by the network to detach the IMSI for GPRS services. The GPRS detach procedure causes the MS to be marked as inactive in the network for GPRS services, non-GPRS services or both services.

In GSM, if the GPRS detach procedure is performed, the PDP contexts are deactivated locally without peer to peer signalling between the SM and LLC entities in the MS and the network.

In UMTS, if the GPRS detach procedure is performed, the PDP contexts are deactivated locally without peer to peer signalling between the SM entities in the MS and the network.

#### 4.7.4.1 MS initiated GPRS detach procedure

##### 4.7.4.1.1 MS initiated GPRS detach procedure initiation

The GPRS detach procedure is initiated by the MS by sending a DETACH REQUEST message. The detach type information element may indicate "GPRS detach with switching off", "GPRS detach without switching off", "IMSI detach", "GPRS/IMSI detach with switching off" or "GPRS/IMSI detach without switching off".

The MS shall include the P-TMSI in the DETACH REQUEST message. The MS shall also include a valid P-TMSI signature, if available.

If the MS is not switched off and the MS is in the state GMM\_REGISTERED, timer T3321 shall be started after the DETACH REQUEST message has been sent. If the detach type information element value indicates "IMSI Detach" the MS shall enter GMM-REGISTERED.IMSI-DETACH\_INITIATED, otherwise the MS shall enter the state GMM-DEREGISTERED-INITIATED. If the detach type information element value indicates "IMSI Detach" or "GPRS/IMSI Detach", state MM IMSI DETACH PENDING is entered. If the MS is to be switched off, the MS shall try for a period of 5 seconds to send the DETACH REQUEST message. If the MS is able to send the DETACH REQUEST message during this time the MS may be switched off.

If the detach type information element value indicates "GPRS detach without switching off" and the MS is attached for GPRS and non-GPRS services and the network operates in network operation mode I, then if in the MS the timer T3212 is not already running, the timer T3212 shall be set to its initial value and restarted after the DETACH REQUEST message has been sent.

##### 4.7.4.1.2 MS initiated GPRS detach procedure completion for GPRS services only

When the DETACH REQUEST message is received by the network, the network shall send a DETACH ACCEPT message to the MS, if the detach type IE value indicates that the detach request has not been sent due to switching off. If switching off was indicated, the procedure is completed when the network receives the DETACH REQUEST message. The network and the MS shall deactivate the PDP contexts and deactivate the logical link(s), if any.

The MS is marked as inactive in the network for GPRS services; state GMM-DEREGISTERED is entered in the MS and the network.

In UMTS, if the detach has been sent due to switching off, then the network shall release the resources in the lower layers for this MS (see 3GPP TS 25.331).

**NOTE:** When the DETACH REQUEST message is received by the network, and if the detach type IE value indicates that the detach is not due to power off, the authentication and ciphering procedure as well as the identification procedure may be performed.

#### 4.7.4.1.3 MS initiated combined GPRS detach procedure completion

When the DETACH REQUEST message is received by the network, a DETACH ACCEPT message shall be sent to the MS, if the detach type IE value indicates that the detach request has not been sent due to switching off. Depending on the value of the detach type IE the following applies:

##### GPRS/IMSI detach:

The MS is marked as inactive in the network for GPRS and for non-GPRS services. The network and the MS shall deactivate the PDP contexts and deactivate the logical link(s), if any. The States GMM-DEREGISTERED and MM NULL are entered in both the MS and the network.

In UMTS, if the detach has been sent due to switching off, then the network shall release the resources in the lower layers for this MS (see 3GPP TS 25.331).

##### IMSI detach:

The MS is marked as inactive in the network for non-GPRS services. State MM NULL is entered in the MS and the network.

#### 4.7.4.1.4 Abnormal cases in the MS

The following abnormal cases can be identified:

##### a) T3321 time-out

On the first expiry of the timer, the MS shall retransmit the DETACH REQUEST message and shall reset and restart timer T3321. This retransmission is repeated four times, i.e. on the fifth expiry of timer T3321, the GPRS detach procedure shall be aborted, the MS shall change to state:

- MM-NULL if "IMSI detach" was requested;
- GMM-REGISTERED.NORMAL-SERVICE if "IMSI Detach" was requested
- GMM-DEREGISTERED if "GPRS detach" was requested;
- GMM-DEREGISTERED and MM-NULL if "GPRS/IMSI" detach was requested.

##### b) Lower layer failure before reception of DETACH ACCEPT message

The detach procedure is aborted and the MS shall change to state:

- MM-NULL if "IMSI detach" was requested;
- GMM-REGISTERED.NORMAL-SERVICE if "IMSI Detach" was requested
- GMM-DEREGISTERED if "GPRS detach" was requested;
- GMM-DEREGISTERED and MM-NULL if "IMSI/GPRS" detach was requested.

##### c) Detach procedure collision

If the MS receives a DETACH REQUEST message before the MS initiated GPRS detach procedure has been completed, a DETACH ACCEPT message shall be sent to the network.

##### d) Detach and GMM common procedure collision

GPRS detach containing cause "power off":

- If the MS receives a message used in a GMM common procedure before the GPRS detach procedure has been completed, this message shall be ignored and the GPRS detach procedure shall continue.

GPRS detach containing other causes than "power off"

- If the MS receives a P-TMSI REALLOCATION COMMAND, a GMM STATUS, or a GMM INFORMATION message before the GPRS detach procedure has been completed, this message shall be ignored and the GPRS detach procedure shall continue.

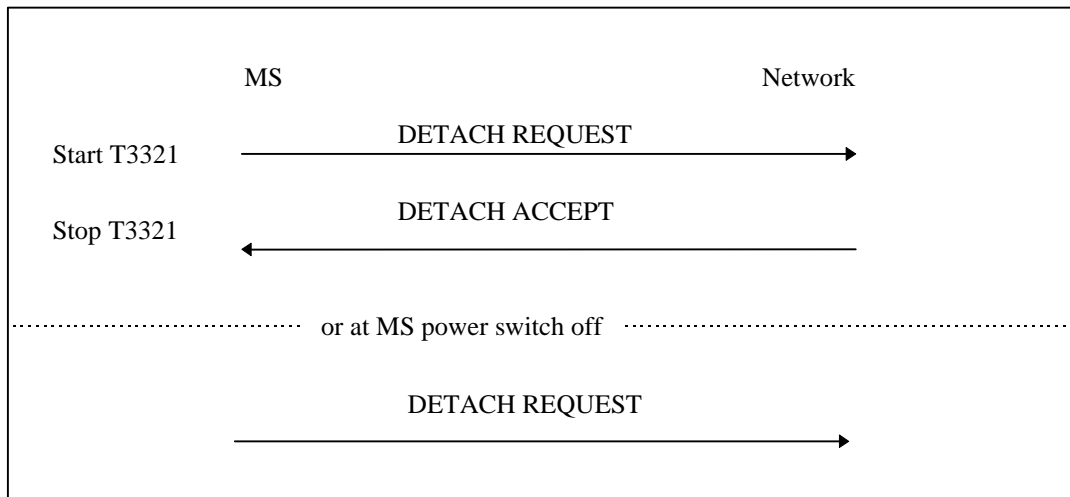
- If the MS receives an AUTHENTICATION AND CIPHERING REQUEST or IDENTITY REQUEST message, before the GPRS detach procedure has been completed, the MS shall respond to it as described in section 4.7.7 and 4.7.8 respectively.

e) Change of cell within the same RA (GSM only)

If a cell change occurs within the same RA before a DETACH ACCEPT message has been received, then the cell update procedure shall be performed before completion of the detach procedure.

f) Change of cell into a new routing area.

If a cell change into a new routing area occurs before a DETACH ACCEPT message has been received, the GPRS detach procedure shall be aborted and re-initiated after successfully performing a routing area updating procedure.



**Figure 4.7.4/1 3GPP TS 24.008: MS initiated GPRS detach procedure**

#### 4.7.4.2 Network initiated GPRS detach procedure

##### 4.7.4.2.1 Network initiated GPRS detach procedure initiation

The network initiates the GPRS detach procedure by sending a DETACH REQUEST message to the MS. The DETACH REQUEST message shall include a detach type IE. In addition, the network may include a cause IE to specify the reason for the detach request. The network shall start timer T3322. If the detach type IE indicates "re-attach not required" or "re-attach required", the network shall deactivate the PDP contexts and deactivate the logical link(s), if any, and shall change to state GMM-DEREGISTERED-INITIATED.

##### 4.7.4.2.2 Network initiated GPRS detach procedure completion by the MS

When receiving the DETACH REQUEST message and the detach type IE indicates "re-attach not required" or "re-attach required", the MS shall deactivate the PDP contexts and deactivate the logical link(s), if any. The MS shall then send a DETACH ACCEPT message to the network and shall change state to GMM-DEREGISTERED. The MS shall, after the completion of the GPRS detach procedure, initiate a GPRS attach procedure if indicated by the network in the detach type IE.

A GPRS MS operating in MS operation mode A or B in network operation mode I, which receives an DETACH REQUEST message with detach type indicating "re-attach required" or "re-attach not required" and no cause code, is only detached for GPRS services in the network.

When receiving the DETACH REQUEST message and the detach type IE indicates "IMSI detach", the MS shall not deactivate the PDP contexts. The MS shall set the MM update status to U2 NOT UPDATED. A MS in operation mode A or B in network operation mode I may send a DETACH ACCEPT message to the network, and shall re-attach to non-GPRS service by performing the combined routing area updating procedure according to section 4.7.5.2, sending a ROUTING AREA UPDATE REQUEST message with Update type IE indicating "combined RA/LA updating with

IMSI attach". A MS in operation mode C, or in MS operation mode A or B in network operation mode II or III, shall send a DETACH ACCEPT message to the network.

If the detach type IE indicates "IMSI detach", or "re-attach required" then the MS shall ignore the cause code if received.

If the detach type information element value indicates "re-attach required" or "re-attach not required" and the MS is attached for GPRS and non-GPRS services and the network operates in network operation mode I, then if in the MS the timer T3212 is not already running, the timer T3212 shall be set to its initial value and restarted.

If the detach type IE indicates "re-attach required", the MS shall perform a new attach procedure. The MS should also activate PDP context(s) to replace any previously active PDP contexts.

NOTE: In some cases, user interaction may be required and then the MS cannot activate the PDP context(s) automatically.

If the detach type IE indicates "re-attach not required", then, depending on the received cause code, the MS shall act as follows:

# 2 (IMSI unknown in HLR);

The MS shall set the update status to U3 ROAMING NOT ALLOWED and shall delete any TMSI, LAI and ciphering key sequence number. The new MM state is MM IDLE. The SIM shall be considered as invalid for non-GPRS services until switching off or the SIM is removed.

A GPRS MS operating in MS operation mode A or B in network operation mode I, is still IMSI attached for GPRS services in the network.

# 3 (Illegal MS);

# 6 (Illegal ME);

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number. The new GMM state is GMM-DEREGISTERED. The SIM shall be considered as invalid for GPRS services until switching off or the SIM is removed.

A GPRS MS operating in MS operation mode A or B shall in addition set the update status to U3 ROAMING NOT ALLOWED, shall delete any TMSI, LAI and ciphering key sequence number. The new MM state is MM idle. The SIM shall be considered as invalid also for non-GPRS services until switching off or the SIM is removed.

# 7 (GPRS services not allowed);

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number. The SIM shall be considered as invalid for GPRS services until switching off or the SIM is removed. The new state is GMM-DEREGISTERED.

A GPRS MS operating in MS operation mode A or B in network operation mode I shall set the timer T3212 to its initial value and restart it, if it is not already running.

A GPRS MS operating in MS operation mode A or B in network operation mode I, is still IMSI attached for CS services in the network.

# 8 (GPRS services and non-GPRS services not allowed);

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED and the update status to U3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2). Furthermore, it shall delete any P-TMSI, P-TMSI signature, TMSI, RAI, LAI, ciphering key sequence number and GPRS ciphering key sequence number and shall consider the SIM as invalid for GPRS and non-GPRS services until switching off or the SIM is removed.

# 11 (PLMN not allowed);

# 12 (Location area not allowed);



# 13 (Roaming not allowed in this location area); or

# 15 (No Suitable Cells In Location Area);

The MS shall delete any RAI or LAI, P-TMSI, P-TMSI signature and GPRS ciphering key sequence number, shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2).

A GPRS MS operating in MS operation mode A or B shall in addition set the update status to U3 ROAMING NOT ALLOWED and shall delete any TMSI, LAI and ciphering key sequence number. The new MM state is MM IDLE.

The MS shall store the LAI or the PLMN identity in the appropriate forbidden list, i.e. in the "forbidden PLMN list" for cause #11, in the list of "forbidden location areas for regional provision of service" for cause #12 or in the list of "forbidden location areas for roaming" for cause #13 and #15. If #11 or #13 was received, the MS shall perform a PLMN selection instead of a cell selection. If cause #15 was received the MS shall search for a suitable cell in a different location area on the same PLMN.

# 14 (GPRS services not allowed in this PLMN)

The MS shall delete any RAI, P-TMSI, P-TMSI signature, and GPRS ciphering key sequence number stored, shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and shall change to state GMM-DEREGISTERED.

The MS shall store the PLMN identity in the "forbidden PLMNs for GPRS service" list.

A GPRS MS operating in MS operation mode A or B in network operation mode I shall set the timer T3212 to its initial value and restart it, if it is not already running.

A GPRS MS operating in MS operation mode A or B, is still IMSI attached for CS services in the network.

Other cause values shall not impact the update status. Further actions of the MS are implementation dependent.

#### 4.7.4.2.3 Network initiated GPRS detach procedure completion by the network

The network shall, upon receipt of the DETACH ACCEPT message, stop timer T3322 and shall change state to GMM-DEREGISTERED.

#### 4.7.4.2.4 Abnormal cases on the network side

The following abnormal cases can be identified:

a) T3322 time-out

On the first expiry of the timer, the network shall retransmit the DETACH REQUEST message and shall start timer T3322. This retransmission is repeated four times, i.e. on the fifth expiry of timer T3322, the GPRS detach procedure shall be aborted and the network changes to state GMM-DEREGISTERED.

b) Low layer failure

The GPRS detach procedure is aborted and the network changes to state GMM-DEREGISTERED.

c) GPRS detach procedure collision

If the network receives a DETACH REQUEST message with "switching off" indicated, before the network initiated GPRS detach procedure has been completed, both procedures shall be considered completed.

If the network receives a DETACH REQUEST message without "switching off" indicated, before the network initiated GPRS detach procedure has been completed, the network shall send a DETACH ACCEPT message to the MS.

d) GPRS detach and GPRS attach procedure collision

If the network receives an ATTACH REQUEST message before the network initiated GPRS detach procedure with type of detach 're-attach not required' has been completed, the network shall ignore the ATTACH

REQUEST message. If the detach type IE value, sent in the DETACH REQUEST message, indicates "re-attach required" the detach procedure is aborted and the GPRS attach procedure shall be progressed after the PDP contexts have been deleted. If the detach type IE value, sent in the DETACH REQUEST message, indicates "IMSI detach" the detach procedure is aborted and the GPRS attach procedure shall be progressed.

e) GPRS detach and routing area updating procedure collision

GPRS detach containing detach type "re-attach required" or "re-attach not required":

If the network receives a ROUTING AREA UPDATE REQUEST message before the network initiated GPRS detach procedure has been completed, the detach procedure shall be progressed, i.e. the ROUTING AREA UPDATE REQUEST message shall be ignored.

GPRS detach containing detach type "IMSI detach":

If the network receives a ROUTING AREA UPDATE REQUEST message before the network initiated GPRS detach procedure has been completed, the network shall abort the detach procedure, shall stop T3322 and shall progress the routing area update procedure.

f) GPRS detach and service request procedure collision

If the network receives a SERVICE REQUEST message before the network initiated GPRS detach procedure has been completed, the network shall ignore the SERVICE REQUEST message.

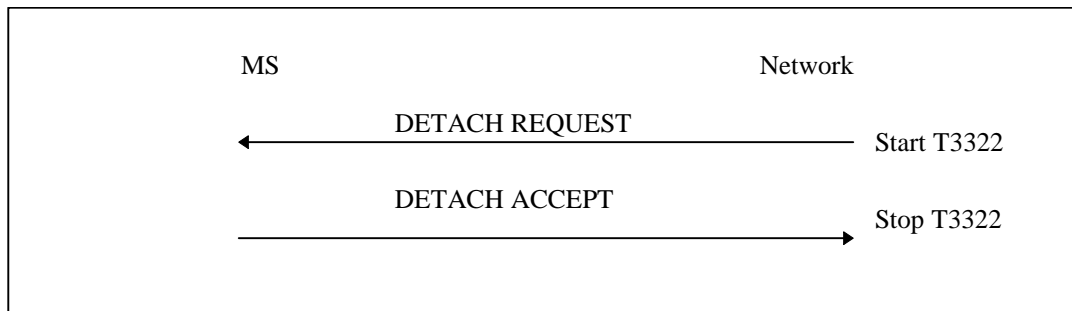


Figure 4.7.4/2 3GPP TS 24.008: Network initiated GPRS detach procedure

## 4.7.5 Routing area updating procedure

This procedure is used for:

- normal routing area updating to update the registration of the actual routing area of an MS in the network. This procedure is used by GPRS MSs in MS operation mode C and by GPRS MSs in MS operation modes A or B that are IMSI attached for GPRS and non-GPRS services if the network operates in network operation mode II or III;
- combined routing area updating to update the registration of the actual routing and location area of an MS in the network. This procedure is used by GPRS MSs in MS operation modes A or B that are IMSI attached for GPRS and non-GPRS services provided that the network operates in network operation mode I;
- periodic routing area updating. This procedure is used by GPRS MSs in MS operation mode C and by GPRS MSs in MS operation modes A or B that are IMSI attached for GPRS or for GPRS and non-GPRS services independent of the network operation mode;
- IMSI attach for non-GPRS services when the MS is IMSI attached for GPRS services. This procedure is used by GPRS MSs in MS operation modes A or B, if the network operates in network operation mode I;
- in GSM, resuming GPRS services when the RR sublayer indicated a resumption failure after dedicated mode was left, see 3GPP TS 44.018;
- in GSM, updating the network with the new MS Radio Access Capability IE when the content of the IE has changed. Normal or combined routing area updating procedure is used.;
- UMTS to GSM and for GSM to UMTS intersystem change, see section 4.7.1.7; or

- in UMTS, to re-synchronize the PMM mode of MS and network after RRC connection release with cause "Directed signalling connection re-establishment", see Section 4.7.2.5.

Section 4.7.5.1 describes the routing area updating procedures for updating the routing area only. The combined routing area updating procedure used to update both the routing and location area is described in section 4.7.5.2.

The routing area updating procedure is always initiated by the MS. It is only invoked in state GMM-REGISTERED.

To limit the number of subsequently rejected routing area update attempts, a routing area updating attempt counter is introduced. The routing area updating attempt counter shall be incremented as specified in section 4.7.5.1.5. Depending on the value of the routing area updating attempt counter, specific actions shall be performed. The routing area updating attempt counter shall be reset when:

- a GPRS attach procedure is successfully completed; or
- a routing area updating procedure is successfully completed;

and additionally when the MS is in substate ATTEMPTING-TO-UPDATE:

- a new routing area is entered;
- expiry of timer T3302; or
- at request from registration function.

The mobile equipment shall contain a list of "forbidden location areas for roaming", as well as a list of "forbidden location areas for regional provision of service". The handling of these lists is described in section 4.4.1.

The Mobile Equipment shall contain a list of "equivalent PLMNs". The handling of this list is described in section 4.4.1.

In GSM, user data transmission in the MS shall be suspended during the routing area updating procedure; user data reception shall be possible. User data transmission in the network shall be suspended during the routing area updating procedure, if a new P-TMSI is assigned.

In UMTS, user data transmission and reception in the MS shall not be suspended during the routing area updating procedure. User data transmission in the network shall not be suspended during the routing area updating procedure.

In UMTS, when a ROUTING AREA UPDATE REQUEST is received by the SGSN over a new PS signalling connection while there is an ongoing PS signalling connection (network is already in mode PMM-CONNECTED) for this UE, the network shall progress the routing area update procedure as normal and release the previous PS signalling connection when the routing area update procedure has been accepted by the network.

Note: The re-establishment of the radio bearers of active PDP contexts is done as described in section "Service Request procedure".

#### 4.7.5.1 Normal and periodic routing area updating procedure

Periodic routing area updating is used to periodically notify the availability of the MS to the network. The value of the update type IE in the ROUTING AREA UPDATE REQUEST message shall indicate "periodic updating". The procedure is controlled in the MS by timer T3312. When timer T3312 expires, the periodic routing area updating procedure is started. Start and reset of timer T3312 is described in section 4.7.2.2.

In GSM, the normal routing area updating procedure is initiated when the MS detects a change of the routing area in state GMM-REGISTERED, or when the MS determines that GPRS resumption shall be performed or when the MS needs to update the network with the new MS Radio Access Capability IE. The ROUTING AREA UPDATE REQUEST message shall always be the first data sent by the MS when a routing area border is crossed. The routing area identification is broadcast on the broadcast channel(s).

In UMTS, the normal routing area updating procedure is initiated when the MS detects a change of the routing area in state GMM-REGISTERED. The ROUTING AREA UPDATE REQUEST message shall always be the first GMM message sent by the MS when a routing area border is crossed.

A normal routing area updating shall abort any ongoing GMM procedure. Aborted GMM procedures may be repeated after the normal routing area updating procedure has been successfully performed. The value of the update type IE included in the message shall indicate "normal routing area updating".

#### 4.7.5.1.1 Normal and periodic routing area updating procedure initiation

To initiate the normal routing area updating procedure, the MS sends the message ROUTING AREA UPDATE REQUEST to the network, starts timer T3330 and changes to state GMM-ROUTING-AREA-UPDATING-INITIATED. The message ROUTING AREA UPDATE REQUEST shall contain the P-TMSI signature when received within a previous ATTACH ACCEPT or ROUTING AREA UPDATE ACCEPT message.

In UMTS, if the MS wishes to prolong the established PS signalling connection after the normal routing area updating procedure, it may set a follow-on request pending indicator on.

#### 4.7.5.1.2 GMM Common procedure initiation

The network may initiate GMM common procedures, e.g. the GMM authentication and ciphering procedure.

#### 4.7.5.1.3 Normal and periodic routing area updating procedure accepted by the network

If the routing area updating request has been accepted by the network, a ROUTING AREA UPDATE ACCEPT message shall be sent to the MS. The network may assign a new P-TMSI and/or a new P-TMSI signature for the MS. If a new P-TMSI and/or P-TMSI signature have been assigned to the MS, it/they shall be included in the ROUTING AREA UPDATE ACCEPT message together with the routing area identification.

In GSM the Cell Notification information element shall be included in the ROUTING AREA UPDATE ACCEPT message in order to indicate the ability of the network to support the Cell Notification.

The network shall change to state GMM-COMMON-PROCEDURE-INITIATED and shall start the supervision timer T3350 as described in section 4.7.6.

If the LAI or PLMN identity contained in the ROUTING AREA UPDATE ACCEPT message is a member of any of the "forbidden" lists then any such entry shall be deleted.

In UMTS, the network should prolong the PS signalling connection if the mobile station has indicated a follow-on request pending in ROUTING AREA UPDATE REQUEST. The network may also prolong the PS signalling connection without any indication from the mobile terminal.

If the PDP context status information element is included in ROUTING AREA UPDATE REQUEST message, then the network shall deactivate all those PDP contexts locally (without peer to peer signalling between the MS and the network), which are not in SM state PDP-INACTIVE on network side but are indicated by the MS as being in state PDP-INACTIVE.

Upon receipt of a ROUTING AREA UPDATE ACCEPT message, the MS stores the received routing area identification, stops timer T3330, shall reset the routing area updating attempt counter and sets the GPRS update status to GU1 UPDATED. If the message contains a P-TMSI, the MS shall use this P-TMSI as new temporary identity for GPRS services and shall store the new P-TMSI. If no P-TMSI was included by the network in the ROUTING AREA UPDATING ACCEPT message, the old P-TMSI shall be kept. Furthermore, the MS shall store the P-TMSI signature if received in the ROUTING AREA UPDATING ACCEPT message. If no P-TMSI signature was included in the message, the old P-TMSI signature, if available, shall be deleted.

If the PDP context status information element is included in ROUTING AREA UPDATE ACCEPT message, then the MS shall deactivate all those PDP contexts locally (without peer to peer signalling between the MS and network), which are not in SM state PDP-INACTIVE in the MS but are indicated by the network as being in state PDP-INACTIVE.

In GSM, if the ROUTING AREA UPDATE ACCEPT message contains the Cell Notification information element, then the MS shall start to use the LLC NULL frame to perform cell updates.

The network may also send a list of "equivalent PLMNs" in the ROUTING AREA UPDATE ACCEPT message. Each entry of the list contains a PLMN code (MCC+MNC). The mobile station shall store the list, as provided by the network, except that any PLMN code that is already in the "forbidden PLMN" list shall be removed from the "equivalent PLMNs" list before it is stored by the mobile station. In addition the mobile station shall add to the stored list the PLMN code of the network that sent the list. All PLMNs in the stored list shall be regarded as equivalent to each

other for PLMN selection, cell selection/re-selection and handover. The stored list in the mobile station shall be replaced on each occurrence of the ROUTING AREA UPDATE ACCEPT message. If no list is contained in the message, then the stored list in the mobile station shall be deleted. The list shall be stored in the mobile station while switched off so that it can be used for PLMN selection after switch on.

A ROUTING AREA UPDATE COMPLETE message shall be returned to the network if the ROUTING AREA UPDATE ACCEPT message contained:

- a P-TMSI; and/or
- Receive N-PDU Numbers (see 3GPP TS 44.065 [78] and 3GPP TS 25.322).

In this case the Receive N-PDU Numbers values valid in the MS, shall be included in the ROUTING AREA UPDATE COMPLETE message.

NOTE: In UMTS, after a routing area updating procedure, the mobile station can initiate Service Request procedure to request the resource reservation for the active PDP contexts if the resources have been released by the network or send upper layer message (e.g. ACTIVATE PDP CONTEXT REQUEST) to the network via the existing PS signaling connection.

After that in UMTS, if the mobile station has indicated follow-on request pending and has a CM application request pending, it shall send an appropriate message (for example ACTIVATE PDP CONTEXT REQUEST) to the network.

#### 4.7.5.1.4 Normal and periodic routing area updating procedure not accepted by the network

If the routing area updating cannot be accepted, the network sends a ROUTING AREA UPDATE REJECT message to the MS. An MS that receives a ROUTING AREA UPDATE REJECT message, deletes the list of “equivalent PLMNs”, and stops timer T3330. The MS shall then take different actions depending on the received reject cause value:

# 3 (Illegal MS);

# 6 (Illegal ME);

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and enter the state GMM-DEREGISTERED. Furthermore, it shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number and shall consider the SIM as invalid for GPRS services until switching off or the SIM is removed.

If the MS is IMSI attached via MM procedures, the MS shall in addition set the update status to U3 ROAMING NOT ALLOWED, shall delete any TMSI, LAI and ciphering key sequence number. The new MM state is MM IDLE. The SIM shall be considered as invalid also for non-GPRS services until switching off or the SIM is removed.

# 7 (GPRS services not allowed);

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2.9) and shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number. The SIM shall be considered as invalid for GPRS services until switching off or the SIM is removed. The new state is GMM-DEREGISTERED.

If the update type is “periodic updating” a GPRS MS operating in MS operation mode A or B in networkoperation mode I shall set the timer T3212 to its initial value and restart it, if it is not already running.

# 9 (MS identity cannot be derived by the network);

The MS shall set the GPRS update status to GU2 NOT UPDATED (and shall store it according to section 4.1.3.2), enter the state GMM-DEREGISTERED, and shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number. Subsequently, the MS may automatically initiate the GPRS attach procedure.

# 10 (Implicitly detached);

The MS shall change to state GMM-DEREGISTERED.NORMAL-SERVICE. The MS shall then perform a new attach procedure. The MS should also activate PDP context(s) to replace any previously active PDP contexts.

NOTE: In some cases, user interaction may be required and then the MS cannot activate the PDP context(s) automatically.

# 11 (PLMN not allowed);

# 12 (Location area not allowed);

# 13 (Roaming not allowed in this location area); or

# 15 (No Suitable Cells In Location Area);

- The MS shall delete any RAI, P-TMSI, P-TMSI signature and GPRS ciphering key sequence number, shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and enter the state GMM-DEREGISTERED.

If the MS is IMSI attached via MM procedures, the MS shall in addition set the update status to U3 ROAMING NOT ALLOWED and shall delete any TMSI, LAI and ciphering key sequence number and shall reset the location update attempt counter. The new MM state is MM IDLE.

The MS shall store the LAI or the PLMN identity in the appropriate forbidden list, i.e. in the "forbidden PLMN list" for cause #11, in the list of "forbidden location areas for regional provision of service" for cause #12 or in the list of "forbidden location areas for roaming" for cause #13 and #15. If #11 or #13 was received, the MS shall perform a PLMN selection instead of a cell selection. If cause #15 was received the MS shall search for a suitable cell in a different location area on the same PLMN.

# 14 (GPRS services not allowed in this PLMN)

The MS shall delete any RAI, P-TMSI, P-TMSI signature, and GPRS ciphering key sequence number stored, shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and shall change to state GMM-DEREGISTERED.

The MS shall store the PLMN identity in the "forbidden PLMNs for GPRS service" list. A GPRS MS operating in MS operation mode C shall perform a PLMN selection instead of a cell selection.

If the update type is "periodic updating" a GPRS MS operating in MS operation mode A or B in network operation mode I shall set the timer T3212 to its initial value and restart it, if it is not already running.

A GPRS MS operating in MS operation mode A or B in network operation mode II or III, is still IMSI attached for CS services in the network.

Other values are considered as abnormal cases. The specification of the MS behaviour in those cases is described in section 4.7.5.1.5.

#### 4.7.5.1.5 Abnormal cases in the MS

The following abnormal cases can be identified:

- a) Access barred because of access class control

The routing area updating procedure shall not be started. The MS stays in the current serving cell and applies the normal cell reselection process. The procedure is started as soon as possible and if still necessary, i.e. when the barred state is removed or because of a cell change.

- b) Lower layer failure before the ROUTING AREA UPDATE ACCEPT or ROUTING AREA UPDATE REJECT message is received

The procedure shall be aborted. The MS shall proceed as described below.

- c) T3330 time-out

The procedure is restarted four times, i.e. on the fifth expiry of timer T3330, the MS shall abort the procedure. The MS shall proceed as described below.

- d) ROUTING AREA UPDATE REJECT, other causes than those treated in section 4.7.5.1.4

The MS shall proceed as described below.

e) If a routing area border is crossed, when the MS is in state GMM-ROUTING-AREA-UPDATE-INITIATED, the routing area updating procedure shall be aborted and re-initiated immediately. The MS shall set the GPRS update status to GU2 NOT UPDATED.

f) In GSM, if a cell change occurs within the same RA, when the MS is in state GMM-ROUTING-AREA-UPDATE-INITIATED, the cell update procedure is performed, before completion of the routing area updating procedure.

g) Routing area updating and detach procedure collision

GPRS detach containing detach type "re-attach required" or "re-attach not required":

If the MS receives a DETACH REQUEST message before the routing area updating procedure has been completed, the routing area updating procedure shall be aborted and the GPRS detach procedure shall be progressed.

GPRS detach containing detach type "IMSI detach":

If the MS receives a DETACH REQUEST message before the routing area updating procedure has been completed, the routing area updating procedure shall be progressed, i.e. the DETACH REQUEST message shall be ignored.

h) Routing area updating and P-TMSI reallocation procedure collision

If the MS receives a P-TMSI REALLOCATION REQUEST message before the routing area updating procedure has been completed, the P-TMSI reallocation procedure shall be aborted and the routing area updating procedure shall be progressed.

In cases b, c and d the MS shall proceed as follows:

Timer T3330 shall be stopped if still running. The routing area updating attempt counter shall be incremented.

If the routing area updating attempt counter is less than 5, and the stored RAI is equal to the RAI of the current serving cell and the GMM update status is equal to GU1 UPDATED:

- the MS shall keep the GMM update status to GU1 UPDATED and changes state to GMM-REGISTERED.NORMAL-SERVICE. The MS shall start timer T3311. When timer T3311 expires the routing area updating procedure is triggered again.

If the routing area updating attempt counter is less than 5, and the stored RAI is different to the RAI of the current serving cell or the GMM update status is different to GU1 UPDATED:

- the MS shall start timer T3311, shall set the GPRS update status to GU2 NOT UPDATED and changes state to GMM-REGISTERED.ATTEMPTING-TO-UPDATE.
- If the routing area updating attempt counter is greater than or equal to 5:
- the MS shall start timer T3302, shall set the GPRS update status to GU2 NOT UPDATED and shall change to state GMM-REGISTERED.ATTEMPTING-TO-UPDATE or optionally to GMM-REGISTERED.PLMN-SEARCH(see 4.2.4.1.2).
- In UMTS, in case c the MS shall release the PS signaling connection and in case d the network shall release the PS signaling connection for this MS (see 3GPP TS 25.331).

#### 4.7.5.1.6 Abnormal cases on the network side

The following abnormal cases can be identified:

- a) If a lower layer failure occurs before the message ROUTING AREA UPDATE COMPLETE has been received from the MS and a P-TMSI and/or PTMSI signature has been assigned, the network shall abort the procedure and shall consider both, the old and new P-TMSI and the corresponding P-TMSI signatures as valid until the old P-TMSI can be considered as invalid by the network (see section 4.7.1.5). During this period the network may use the identification procedure followed by a P-TMSI reallocation procedure if the old P-TMSI is used by the MS in a subsequent message.

NOTE: Optionally, paging with IMSI may be used if paging with old and new P-TMSI fails. Paging with IMSI causes the MS to re-attach as described in section 4.7.9.1.

b) Protocol error

If the ROUTING AREA UPDATE REQUEST message has been received with a protocol error, the network shall return a ROUTING AREA UPDATE REJECT message with one of the following reject causes:

- #96: Mandatory information element error;
- #99: Information element non-existent or not implemented;
- #100: Conditional IE error;
- #111: Protocol error, unspecified.

c) T3350 time-out

On the first expiry of the timer, the network shall retransmit the ROUTING AREA UPDATE ACCEPT message and shall reset and restart timer T3350. The retransmission is performed four times, i.e. on the fifth expiry of timer T3350, the routing area updating procedure is aborted. Both, the old and the new P-TMSI and the corresponding P-TMSI signatures shall be considered as valid until the old P-TMSI can be considered as invalid by the network(see section 4.7.1.5). During this period the network acts as described for case a above.

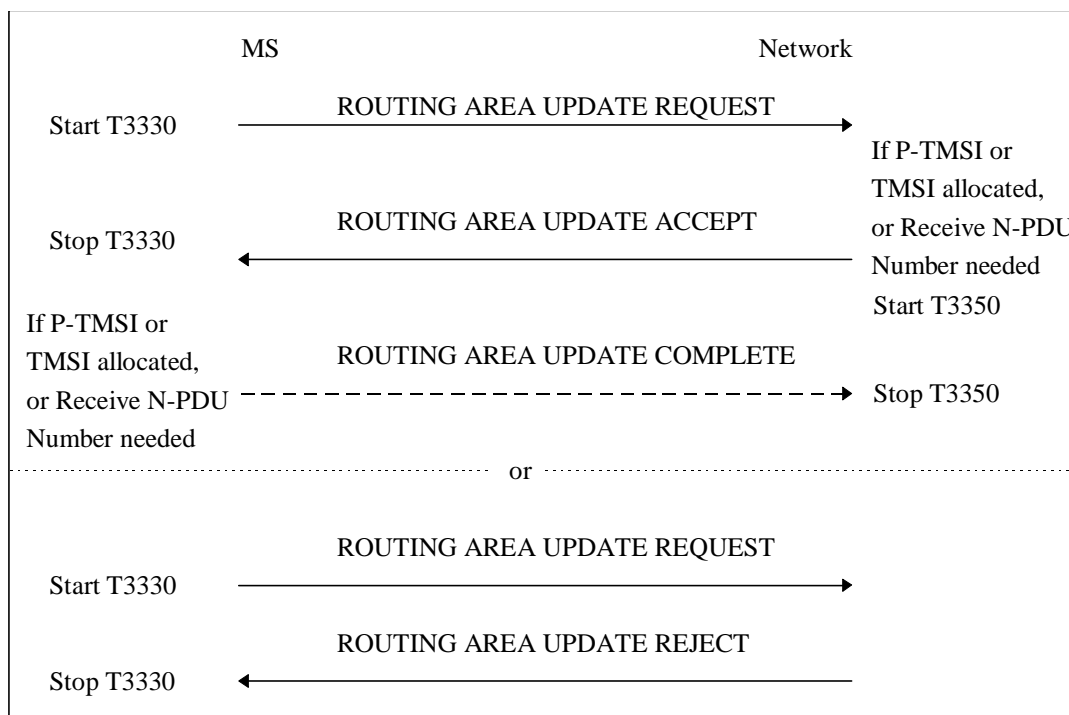


Figure 4.7.5/1 3GPP TS 24.008: Routing and combined routing area updating procedure

4.7.5.2 Combined routing area updating procedure

Within a combined routing area updating procedure the messages ROUTING AREA UPDATE ACCEPT and ROUTING AREA UPDATE COMPLETE carry information for the routing area updating and the location area updating.

4.7.5.2.1 Combined routing area updating procedure initiation

The combined routing area updating procedure is initiated only by a GPRS MS operating in MS operation modes A or B, if the MS is in state GMM-REGISTERED and if the network operates in network operation mode I:

- when a GPRS MS that is IMSI attached for GPRS and non-GPRS services detects a change of the routing area in state GMM-REGISTERED and MM-IDLE;



- when a GPRS MS that is IMSI attached for GPRS services wants to perform an IMSI attach for non-GPRS services;
- after termination of a non-GPRS service via non-GPRS channels to update the association if the MS has changed the LA during that non-GPRS service transaction;
- after a CM SERVICE REJECT message with cause value #4 is received by the mobile station (see section 4.5.1.1), in which case the update type IE shall be set to "Combined RA/LA updating with IMSI attach";
- when a GPRS MS needs to update the network with the new MS Radio Access Capability IE; or
- in UMTS, to re-synchronize the PMM mode of MS and network after RRC connection release with cause "Directed signalling connection re-establishment", see Section 4.7.2.5.

In GSM, the routing and location area identification are broadcast on the broadcast channel(s). A combined routing area updating procedure shall abort any ongoing GMM procedure. Aborted GMM procedures shall be repeated after the combined routing area updating procedure has been successfully performed. The ROUTING AREA UPDATE REQUEST message shall always be the first message sent from the MS in the new routing area after routing area change.

In UMTS, the routing and location area identification are broadcast on the broadcast channel(s) or sent to the MS via the PS signalling connection. A combined routing area updating procedure shall abort any ongoing GMM procedure. Aborted GMM procedures may be repeated after the combined routing area updating procedure has been successfully performed. The ROUTING AREA UPDATE REQUEST message shall always be the first GMM message sent from the MS in the new routing area after routing area change.

To initiate a combined routing area updating procedure the MS sends the message ROUTING AREA UPDATE REQUEST to the network, starts timer T3330 and changes to state GMM-ROUTING-UPDATING-INITIATED and MM LOCATION UPDATING PENDING. The value of the update type IE in the message shall indicate "combined RA/LA updating". If for the last attempt to update the registration of the location area a MM specific procedure was performed, the value of the update type IE in the ROUTING AREA UPDATE REQUEST message shall indicate "combined RA/LA updating with IMSI attach". Furthermore the MS shall include the TMSI status IE if no valid TMSI is available.

A GPRS MS in MS operation modes A or B that is in an ongoing circuit-switched transaction, shall initiate the combined routing area updating procedure after the circuit-switched transaction has been released, if the MS has changed the RA during the circuit-switched transaction and if the network operates in network operation mode I.

A GPRS MS in MS operation mode A shall initiate the combined routing area updating procedure with IMSI attach after the circuit-switched transaction has been released if a GPRS attach was performed during the circuit-switched transaction and provided that the network operates in network operation mode I.

A GPRS MS in MS operation mode A shall perform the normal routing area update procedure during an ongoing circuit-switched transaction.

In UMTS, if the MS wishes to prolong the established PS signalling connection after the normal routing area updating procedure when it is served under UMTS area, it may set a follow-on request pending indicator on.

In UMTS, when a ROUTING AREA UPDATE REQUEST is received by the SGSN over a new PS signalling connection while there is an ongoing PS signalling connection (network is already in mode PMM-CONNECTED) for this UE, the network shall progress the routing area update procedure as normal and release the previous PS signalling connection when the routing area update procedure has been accepted by the network .

Note: The re-establishment of the radio bearers of active PDP contexts is done as described in section "Service Request procedure".

#### 4.7.5.2.2 GMM Common procedure initiation

The network may initiate GMM common procedures, e.g. the GMM authentication and ciphering procedure.

#### 4.7.5.2.3 Combined routing area updating procedure accepted by the network

Depending on the value of the update result IE received in the ROUTING AREA UPDATE ACCEPT message, two different cases can be distinguished:

- Case 1) The update result IE value indicates "combined RA/LA": Routing and location area updating is successful;
- Case 2) The update result IE value indicates "RA only": Routing area updating is successful, but location area updating is not successful.

A ROUTING AREA UPDATE COMPLETE message shall be returned to the network if the ROUTING AREA UPDATE ACCEPT message contains:

- a P-TMSI and/or a TMSI; and/or
- Receive N-PDU Numbers (see 3GPP TS 44.065 [78] and 3GPP TS TS 25.322).

In the latter case, the Receive N-PDU Numbers that are valid in the MS shall be included in the ROUTING AREA UPDATE COMPLETE message.

In UMTS, the network should prolong the PS signalling connection if the mobile station has indicated a follow-on request pending in ROUTING AREA UPDATE REQUEST. The network may also prolong the PS signalling connection without any indication from the mobile terminal.

#### 4.7.5.2.3.1 Combined routing area updating successful

The description for normal routing area update as specified in section 4.7.5.1.3 shall be followed. In addition, the following description for location area updating applies.

The handling at the receipt of the ROUTING AREA UPDATE ACCEPT depends on the value received in the update result IE as specified below.

The TMSI reallocation may be part of the combined routing area updating procedure. The TMSI allocated is then included in the ROUTING AREA UPDATE ACCEPT message together with the location area identification (LAI). The network shall, in this case, change to state GMM-COMMON-PROCEDURE-INITIATED and shall start the timer T3350 as described in section 4.7.6.

The MS, receiving a ROUTING AREA UPDATE ACCEPT message, stores the received location area identification, stops timer T3330, enters state MM IDLE, reset the location update attempt counter and sets the update status to U1 UPDATED. If the ROUTING AREA UPDATE ACCEPT message contains an IMSI, the mobile station is not allocated any TMSI, and shall delete any TMSI accordingly. If the ROUTING AREA UPDATE ACCEPT message contains a TMSI, the MS shall use this TMSI as new temporary identity. The MS shall delete its old TMSI and shall store the new TMSI. In this case, an ROUTING AREA UPDATE COMPLETE message is returned to the network. If neither a TMSI nor an IMSI has been included by the network in the ROUTING AREA UPDATE ACCEPT message, the old TMSI, if any is available, shall be kept.

Any timer used for triggering the location updating procedure (e.g. T3211, T3212) shall be stopped if running.

The network receiving a ROUTING AREA UPDATE COMPLETE message stops timer T3350, changes to GMM-REGISTERED state and considers the new TMSI as valid.

#### 4.7.5.2.3.2 Combined routing are updating successful for GPRS services only

The description for normal routing area update as specified in section 4.7.5.1.3 shall be followed. In addition, the following description for location area updating applies.

The MS receiving the ROUTING AREA UPDATE ACCEPT message takes one of the following actions depending on the reject cause:

- #2 (IMSI unknown in HLR)

The MS shall set the update status to U3 ROAMING NOT ALLOWED and shall delete any TMSI, LAI and ciphering key sequence number. The new MM state is MM IDLE. The SIM shall be considered as invalid for non-GPRS services until switching off or the SIM is removed.

- #16 (MSC temporarily not reachable);
- #17 (Network failure); or

## #22 (Congestion)

The MS shall change to state GMM-REGISTERED.ATTEMPTING-TO-UPDATE-MM. Timer T3330 shall be stopped if still running. The routing area updating attempt counter shall be incremented. If the routing area updating attempt counter is less than 5, and the stored RAI is equal to the RAI of the current serving cell and the GMM update status is equal to GU1 UPDATED:

- the MS shall keep the GMM update status GU1 UPDATED and changes state to GMM-REGISTERED.ATTEMPTING-TO-UPDATE-MM. The MS shall start timer T3311. When timer T3311 expires the combined routing area update procedure indicating "combined RA/LA updating with IMSI attach" is triggered again.

If the routing area updating attempt counter is greater than or equal to 5:

- the MS shall start timer T3302 and shall change to state GMM-REGISTERED.ATTEMPTING-TO-UPDATE-MM;
- a GPRS MS operating in MS operation mode A shall then proceed with appropriate MM specific procedure; a GPRS MS operating in MS operation mode B may then proceed with appropriate MM specific procedures. The MM sublayer shall act as in network operation mode II as long as the combined GMM procedures are not successful and no new RA is entered. The new MM state is IDLE.

Other values are considered as abnormal cases. The combined routing area updating shall be considered as failed for GPRS and non-GPRS services. The specification of the MS behaviour in those cases is specified in section 4.7.5.2.5.

#### 4.7.5.2.4 Combined routing area updating not accepted by the network

If the combined routing area updating cannot be accepted, the network sends a ROUTING AREA UPDATE REJECT message to the MS. An MS that receives a ROUTING AREA UPDATE REJECT message stops timer T3330 and enters state MM IDLE. The MS shall then take different actions depending on the received reject cause:

- # 3 (Illegal MS);
- # 6 (Illegal ME);
- # 7 (GPRS services not allowed);

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number. The SIM shall be considered as invalid for GPRS services until switching off or the SIM is removed. The new state is GMM-DEREGISTERED. If in the MS the timer T3212 is not already running, the timer shall be set to its initial value and restarted.

A GPRS MS operating in MS operation mode A or B in network operation mode I, is still IMSI attached for CS services in the network. and shall then proceed with the appropriate MM specific procedure according to the MM service state

- # 8 (GPRS services and non GPRS services not allowed);

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED and the update status to U3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and enter the state GMM-DEREGISTERED. Furthermore, it shall delete any P-TMSI, P-TMSI signature, TMSI, RAI, LAI, ciphering key sequence number and GPRS ciphering key sequence number and shall consider the SIM as invalid for GPRS and non GPRS services until switching off or the SIM is removed.

- # 9 (MS identity cannot be derived by the network);

The MS shall set the GPRS update status to GU2 NOT UPDATED (and shall store it according to section 4.1.3.2), enter the state GMM-DEREGISTERED, and shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number. Subsequently, the MS may automatically initiate the GPRS attach procedure.

A GPRS MS operating in MS operation mode A or B in network operation mode I, is still IMSI attached for CS services in the network.

# 10 (Implicitly detached);

A GPRS MS operating in MS operation mode A or B in network operation mode I, is IMSI detached for both GPRS and CS services in the network.

The MS shall change to state GMM-DEREGISTERED.NORMAL-SERVICE. The MS shall then perform a new attach procedure. The MS should also activate PDP context(s) to replace any previously active PDP contexts.

NOTE: In some cases, user interaction may be required and then the MS cannot activate the PDP context(s) automatically.

# 11 (PLMN not allowed);

# 12 (Location area not allowed);

# 13 (Roaming not allowed in this location area); or

# 15 (No Suitable Cells In Location Area);

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED and the update status to U3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and enter the state GMM-DEREGISTERED. Furthermore, it shall delete any P-TMSI, P-TMSI signature, TMSI, RAI, LAI, ciphering key sequence number GPRS ciphering key sequence number, and reset the location update attempt counter.

The MS shall store the LAI or the PLMN identity in the appropriate forbidden list, i.e. in the "forbidden PLMN list" for cause #11, in the list of "forbidden location areas for regional provision of service" for cause #12 or in the list of "forbidden location areas for roaming" for cause #13 and #15. If #11 or #13 was received, the MS shall then perform a PLMN selection instead of a cell selection. If cause #15 was received the MS shall search for a suitable cell in a different location area on the same PLMN.

# 14 (GPRS services not allowed in this PLMN)

The MS shall delete any RAI, P-TMSI, P-TMSI signature, and GPRS ciphering key sequence number stored, shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and shall change to state GMM-DEREGISTERED. If in the MS the timer T3212 is not already running, the timer shall be set to its initial value and restarted.

The MS shall store the PLMN identity in the "forbidden PLMNs for GPRS service" list.

A GPRS MS operating in MS operation mode A or B in network operation mode I, is still IMSI attached for CS services in the network and shall then proceed with the appropriate MM specific procedure according to the MM service state.

Other values are considered as abnormal cases. The specification of the MS behaviour in those cases is described in section 4.7.5.2.5.

#### 4.7.5.2.5 Abnormal cases in the MS

The abnormal cases specified in section 4.7.5.1.5 apply with the following modification:

If the GPRS routing area updating counter is less than 5, the MM state remains MM LOCATION UPDATING PENDING.

If the GPRS routing area updating attempt counter is incremented according to section 4.7.5.1.5 the next actions depend on the Location Area Identities (stored on SIM and the one of the current serving cell) and the value of the routing area updating attempt counter.

- if the update status is U1 UPDATED, and the stored LAI is equal to the one of the current serving cell and the routing area updating attempt counter is smaller than 5, then the mobile station shall keep the update status to U1 UPDATED, the new MM state is MM IDLE substate NORMAL SERVICE, or
- if the update status is different from U1 UPDATED, or the stored LAI is different from the one of the current serving cell, or the routing area updating attempt counter is greater or equal to 5, the mobile station shall delete any LAI, TMSI, ciphering key sequence number stored in the SIM and set the update status to U2 NOT UPDATED. The new MM state is MM IDLE substate ATTEMPTING TO UPDATE.

#### 4.7.5.2.6 Abnormal cases on the network side

The abnormal cases specified in section 4.7.5.1.6 apply with the exceptions for cases a and c in which in addition to the P-TMSI and P-TMSI signature the old TMSI shall be considered occupied until the new TMSI is used by the MS in a subsequent message.

#### 4.7.13.4 Service request procedure not accepted by the network

- If the Service request cannot be accepted, the network returns a SERVICE REJECT message to the mobile station. An MS that receives a SERVICE REJECT message stops timer T3317. The MS shall then take different actions depending on the received reject cause value:
    - # 3 (Illegal MS); or
    - # 6 (Illegal ME)
  - The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and enter the state GMM-DEREGISTERED. Furthermore, it shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number and shall consider the SIM as invalid for GPRS services until switching off or the SIM is removed.
  - A GPRS MS operating in MS operation mode A shall in addition set the update status to U3 ROAMING NOT ALLOWED, shall delete any TMSI, LAI and ciphering key sequence number. The new MM state is MM IDLE. The SIM shall be considered as invalid also for non-GPRS services until switching off or the SIM is removed.
    - # 7 (GPRS services not allowed)
  - The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2.9) and shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number. The SIM shall be considered as invalid for GPRS services until switching off or the SIM is removed. The new state is GMM-DEREGISTERED.
    - # 9 (MS identity cannot be derived by the network)
  - The MS shall set the GPRS update status to GU2 NOT UPDATED (and shall store it according to section 4.1.3.2), enter the state GMM-DEREGISTERED, and shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number. Subsequently, the MS may automatically initiate the GPRS attach procedure.
    - # 10 (Implicitly detached)
  - The MS shall change to state GMM-DEREGISTERED.NORMAL-SERVICE. The MS shall then perform a new attach procedure. The MS should also activate PDP context(s) to replace any previously active PDP contexts.
- NOTE: In some cases, user interaction may be required and then the MS cannot activate the PDP context(s) automatically.
- # 11 (PLMN not allowed);
  - # 12 (Location area not allowed); ~~or~~
  - # 13 (Roaming not allowed in this location area); or
  - # 15 (No Suitable Cells In Location Area);
- The MS shall delete any RAI, P-TMSI, P-TMSI signature and GPRS ciphering key sequence number, shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and enter the state GMM-DEREGISTERED.
  - A GPRS MS operating in MS operation mode A shall in addition set the update status to U3 ROAMING NOT ALLOWED and shall delete any TMSI, LAI and ciphering key sequence number. The new MM state is MM IDLE.
  - The MS shall store the LAI or the PLMN identity in the appropriate forbidden list, i.e. in the "forbidden PLMN list" for cause #11, in the list of "forbidden location areas for regional provision of service" for cause #12 or in the list of "forbidden location areas for roaming" for cause #13 and #15. If #11 or #13 was received, the MS shall perform a PLMN selection instead of a cell selection. If cause #15 was received the MS shall search for a suitable cell in a different location area on the same PLMN.

# 40 (No PDP context activated)

- The MS shall deactivate locally all active PDP contexts and the MS shall enter the state GMM-REGISTERED.NORMAL-SERVICE. The MS may also activate PDP context(s) to replace any previously active PDP contexts.

NOTE: In some cases, user interaction may be required and then the MS cannot activate the PDP context(s) automatically.

Other values are considered as abnormal cases. The specification of the MS behaviour in those cases is described in section 4.7.13.5.

#### 4.7.13.5 Abnormal cases in the MS

The following abnormal cases can be identified:

- a) Access barred because of access class control

The Service request procedure shall not be started. The MS stays in the current serving cell and applies normal cell reselection process. The Service request procedure may be started by CM layer if it is still necessary, i.e. when access is granted or because of a cell change.

- b) Lower layer failure before the security mode control procedure is completed, SERVICE ACCEPT or SERVICE REJECT message is received

The procedure shall be aborted.

- c) T3317 expired

The MS shall enter GMM-REGISTERED state.

If the MS is in PMM-IDLE mode then the procedure shall be aborted and the MS shall initiate a PS signalling connection release.

If the MS is in PMM-CONNECTED mode, then the procedure shall be aborted.

- d) SERVICE REJECT received other causes than those treated in section 4.7.x.4

The procedure shall be aborted.

- e) Routing area update procedure is triggered

If a cell change into a new routing area occurs and the necessity of routing area update procedure is determined before the security mode control procedure is completed, a SERVICE ACCEPT or SERVICE REJECT message has been received, the Service request procedure shall be aborted and the routing area updating procedure is started immediately. Follow-on request pending may be indicated in the ROUTING AREA UPDATE REQUEST for the service, which was the trigger of the aborted Service request procedure, to restart the pending service itself or the Service Request procedure after the completion of the routing area updating procedure. If the service type of the aborted SERVICE REQUEST was indicating "data", then the routing area update procedure may be followed by a re-initiated Service request procedure indicating "data", if it is still necessary.

- f) Power off

If the MS is in state GMM-SERVICE-REQUEST-INITIATED at power off, the GPRS detach procedure shall be performed.

- g) Procedure collision

If the MS receives a DETACH REQUEST message from the network in state GMM-SERVICE-REQUEST-INITIATED, the GPRS detach procedure shall be progressed and the Service request procedure shall be aborted. If the cause IE, in the DETACH REQUEST message, indicated a "reattach request", the GPRS attach procedure shall be performed.

#### 4.7.13.6 Abnormal cases on the network side

The following abnormal cases can be identified:

a) Lower layer failure

If a low layer failure occurs before the security mode control procedure is completed, a SERVICE ACCEPT or SERVICE REJECT message has been sent to the MS, the network enters/stays in PMM-IDLE.

b) Protocol error

If the SERVICE REQUEST message is received with a protocol error, the network shall return a SERVICE REJECT message with one of the following reject causes:

#96: Mandatory information element error;

#99: Information element non-existent or not implemented;

#100: Conditional IE error;

#111: Protocol error, unspecified.

The network stays in PMM-IDLE mode.

c.) More than one SERVICE REQUEST received and the procedure has not been completed (i.e., the security mode control procedure has not been completed or SERVICE ACCEPT, SERVICE REJECT message has not been sent),

- If one or more of the information elements in the SERVICE REQUEST message differs from the ones received within the previous SERVICE REQUEST message, the previously initiated Service request procedure shall be aborted and the new Service request procedure shall be progressed ;
- If the information elements do not differ, then the network shall continue with the previous Service request procedure and shall not treat any further this SERVICE REQUEST message.

d) ATTACH REQUEST received before the security mode control procedure has been completed or an SERVICE ACCEPT or an SERVICE REJECT message has been sent.

If an ATTACH REQUEST message is received and the security mode control procedure has not been completed or an SERVICE ACCEPT or an SERVICE REJECT message has not been sent, the network may initiate the GMM common procedures, e.g. the GMM authentication and ciphering procedure. The network may e.g. after a successful GMM authentication and ciphering procedure execution, abort the Service request procedure, the GMM context and PDP contexts, if any, are deleted and the new ATTACH REQUEST is progressed.

e) ROUTING AREA UPDATE REQUEST message received before the security mode control procedure has been completed or an SERVICE ACCEPT or an SERVICE REJECT message has been sent

If an ROUTING AREA UPDATE REQUEST message is received and the security mode control procedure has not been completed or an SERVICE ACCEPT or an SERVICE REJECT message has not been sent, the network may initiate the GMM common procedures, e.g. the GMM authentication and ciphering procedure. The network may e.g. after a successful GMM authentication and ciphering procedure execution, abort the Service request procedure and progress the routing area update procedure.

f) If the Service Type indicates 'data' and the network fails to re-establish some or all RAB(s) then the SGSN may determine if PDP Context Modification or PDP Context Deactivation should be initiated.

The appropriate action depends on the QoS profile of the PDP Context and is an operator choice.

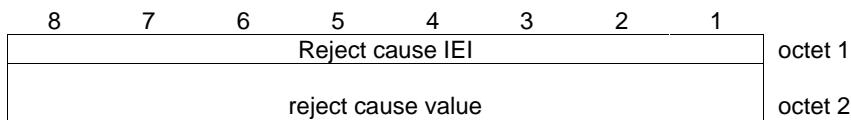


### 10.5.3.6 Reject cause

The purpose of the *Reject Cause* information element is to indicate the reason why a request from the mobile station is rejected by the network.

The *Reject Cause* information element is coded as shown in figure 10.5.81/3GPP TS 24.008 and table 10.5.95/3GPP TS 24.008.

The *Reject Cause* is a type 3 information element with 2 octets length.



**Figure 10.5.81/3GPP TS 24.008 *Reject Cause* information element**

**Table 10.5.95/3GPP TS 24.008: *Reject Cause* information element**

Reject cause value (octet 2)								
Bits								
8	7	6	5	4	3	2	1	
0	0	0	0	0	0	1	0	IMSI unknown in HLR
0	0	0	0	0	0	1	1	Illegal MS
0	0	0	0	0	1	0	0	IMSI unknown in VLR
0	0	0	0	0	1	0	1	IMEI not accepted
0	0	0	0	0	1	1	0	Illegal ME
0	0	0	0	1	0	1	1	PLMN not allowed
0	0	0	0	1	1	0	0	Location Area not allowed
0	0	0	0	1	1	0	1	Roaming not allowed in this location area
<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>No Suitable Cells In Location Area</u>
0	0	0	1	0	0	0	1	Network failure
0	0	0	1	0	1	0	0	MAC failure
0	0	0	1	0	1	0	1	Synch failure
0	0	0	1	0	1	1	0	Congestion
0	0	1	0	0	0	0	0	Service option not supported
0	0	1	0	0	0	0	1	Requested service option not subscribed
0	0	1	0	0	0	1	0	Service option temporarily out of order
0	0	1	0	0	1	1	0	Call cannot be identified
0	0	1	1	0	0	0	0	}
to								} retry upon entry into a new cell
0	0	1	1	1	1	1	1	}
0	1	0	1	1	1	1	1	Semantically incorrect message
0	1	1	0	0	0	0	0	Invalid mandatory information
0	1	1	0	0	0	0	1	Message type non-existent or not implemented
0	1	1	0	0	0	1	0	Message type not compatible with the protocol state
0	1	1	0	0	0	1	1	Information element non-existent or not implemented
0	1	1	0	0	1	0	0	Conditional IE error
0	1	1	0	0	1	0	1	Message not compatible with the protocol state
0	1	1	0	1	1	1	1	Protocol error, unspecified

Any other value received by the mobile station shall be treated as 0010 0010, "Service option temporarily out of order". Any other value received by the network shall be treated as 0110 1111, "Protocol error, unspecified".

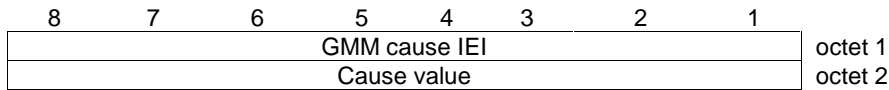
NOTE: The listed reject cause values are defined in Annex G.

**10.5.5.14** ~~10.5.5.14~~ GMM cause

The purpose of the GMM cause information element is to indicate the reason why a GMM request from the mobile station is rejected by the network.

The GMM cause information element is coded as shown in figure 10.5.129/3GPP TS 24.008 and table 10.5.147/3GPP TS 24.008.

The GMM cause is a type 3 information element with 2 octets length.



**Figure 10.5.129/3GPP TS 24.008 : GMM cause information element**

**Table 10.5.147/3GPP TS 24.008 : GMM cause information element**

Cause value (octet 2)								
Bits								
8	7	6	5	4	3	2	1	
0	0	0	0	0	0	1	0	IMSI unknown in HLR
0	0	0	0	0	0	1	1	Illegal MS
0	0	0	0	0	1	1	0	Illegal ME
0	0	0	0	0	1	1	1	GPRS services not allowed
0	0	0	0	1	0	0	0	GPRS services and non-GPRS services not allowed
0	0	0	0	1	0	0	1	MS identity cannot be derived by the network
0	0	0	0	1	0	1	0	Implicitly detached
0	0	0	0	1	0	1	1	PLMN not allowed
0	0	0	0	1	1	0	0	Location Area not allowed
0	0	0	0	1	1	0	1	Roaming not allowed in this location area
0	0	0	0	1	1	1	0	GPRS services not allowed in this PLMN
0	0	0	0	1	1	1	1	<u>No Suitable Cells In Location Area</u>
0	0	0	1	0	0	0	0	MSC temporarily not reachable
0	0	0	1	0	0	0	1	Network failure
0	0	0	1	0	1	0	0	MAC failure
0	0	0	1	0	1	0	1	Synch failure
0	0	0	1	0	1	1	0	Congestion
0	0	1	0	1	0	0	0	No PDP context activated
0	0	1	1	0	0	0	0	}
			to					}
0	0	1	1	1	1	1	1	}
0	1	0	1	1	1	1	1	Semantically incorrect message
0	1	1	0	0	0	0	0	Invalid mandatory information
0	1	1	0	0	0	0	1	Message type non-existent or not implemented
0	1	1	0	0	0	1	0	Message type not compatible with the protocol state
0	1	1	0	0	0	1	1	Information element non-existent or not implemented
0	1	1	0	0	1	0	0	Conditional IE error
0	1	1	0	0	1	0	1	Message not compatible with the protocol state
0	1	1	0	1	1	1	1	Protocol error, unspecified

Any other value received by the mobile station shall be treated as 0110 1111, 'Protocol error, unspecified'. Any other value received by the network shall be treated as 0110 1111, 'Protocol error, unspecified'.

NOTE: The listed reject cause values are defined in Annex G.

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## Annex G (informative): UMTS specific cause values for mobility management

This annex is informative. It describes the cause values for the mobility management procedures for non-GPRS services (MM) and GPRS services (GMM). Sections G1 to G5 are valid for both MM and GMM. However, the following codes are applicable for non-GPRS services only:

#38 Call cannot be identified

Section G.6 applies only for GMM procedures.

---

### G.1 Causes related to MS identification

Cause value = 2 IMSI unknown in HLR

This cause is sent to the MS if the MS is not known (registered) in the HLR. This cause code does not affect operation of the GPRS service, although it may be used by a GMM procedure.

Cause value = 3 Illegal MS

This cause is sent to the MS when the network refuses service to the MS either because an identity of the MS is not acceptable to the network or because the MS does not pass the authentication check, i.e. the SRES received from the MS is different from that generated by the network.

Cause value = 4 IMSI unknown in VLR

This cause is sent to the MS when the given IMSI is not known at the VLR.

Cause value = 5 IMEI not accepted

This cause is sent to the MS if the network does not accept emergency call establishment using an IMEI.

Cause value = 6 Illegal ME

This cause is sent to the MS if the ME used is not acceptable to the network, e.g. blacklisted.

---

### G.2 Cause related to subscription options

Cause value = 11 PLMN not allowed

This cause is sent to the MS if it requests location updating in a PLMN where the MS, by subscription or due to operator determined barring is not allowed to operate.

Cause value = 12 Location Area not allowed

This cause is sent to the MS if it requests location updating in a location area where the MS, by subscription, is not allowed to operate.

Cause value = 13 Roaming not allowed in this location area

This cause is sent to an MS which requests location updating in a location area of a PLMN which offers roaming to that MS in that Location Area, by subscription.

Cause value = 15 No Suitable Cells In Location Area

This cause is sent to the MS if it requests location updating in a location area where the MS, by subscription, is not allowed to operate, but when it should find another allowed location area in the same PLMN.

Note : Cause #15 and cause #12 differ in the fact that cause #12 does not trigger the MS to search for another allowed location area on the same PLMN.

---

## G.3 Causes related to PLMN specific network failures and congestion / Authentication Failures

Cause value = 20 MAC failure

This cause is sent to the network if the SIM detects that the MAC in the authentication request message is not fresh (see TS 33.102)

Cause value = 21 Synch failure

This cause is sent to the network if the SIM detects that the SQN in the authentication request message is out of range (see TS 33.102)

Cause value = 17 Network failure

This cause is sent to the MS if the MSC cannot service an MS generated request because of PLMN failures, e.g. problems in MAP.

Cause value = 22 Congestion

This cause is sent if the service request cannot be actioned because of congestion (e.g. no channel, facility busy/congested etc.)

---

## G.4 Causes related to nature of request

Cause value = 32 Service option not supported

This cause is sent when the MS requests a service/facility in the CM SERVICE REQUEST message which is not supported by the PLMN.

Cause value = 33 Requested service option not subscribed

This cause is sent when the MS requests a service option for which it has no subscription.

Cause value = 34 Service option temporarily out of order

This cause is sent when the MSC cannot service the request because of temporary outage of one or more functions required for supporting the service.

Cause value = 38 Call cannot be identified

This cause is sent when the network cannot identify the call associated with a call re-establishment request.

---

## G.5 Causes related to invalid messages

Cause value = 95 Semantically incorrect message.

See annex H, section H.5.10.

Cause value = 96 Invalid mandatory information.

See annex H, section H.6.1.

Cause value = 97 Message type non-existent or not implemented.

See annex H, section H.6.2.

Cause value = 98 Message not compatible with protocol state.

See annex H, section H.6.3.

Cause value = 99 Information element non-existent or not implemented

See annex H, section H.6.4.

Cause value = 100 Conditional IE error.

See annex H, section H.6.5.

Cause value = 101 Message not compatible with protocol state

See annex H, section H.6.6.

Cause value = 111 Protocol error, unspecified

See annex H, section H.6.8.

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## G.6 Additional cause codes for GMM

Cause value = 7 GPRS services not allowed

This cause is sent to the MS if it requests an IMSI attach for GPRS services, but is not allowed to operate GPRS services.

Cause value = 8 GPRS services and non-GPRS services not allowed

This cause is sent to the MS if it requests a combined IMSI attach for GPRS and non-GPRS services, but is not allowed to operate either of them.

Cause value = 9 MS identity cannot be derived by the network

This cause is sent to the MS when the network cannot derive the MS's identity from the P-TMSI in case of inter-SGSN routing area update.

Cause value = 10 Implicitly detached

This cause is sent to the MS either if the network has implicitly detached the MS, e.g. some while after the Mobile reachable timer has expired, or if the GMM context data related to the subscription does not exist in the SGSN e.g. because of a SGSN restart.

Cause value = 14 GPRS services not allowed in this PLMN

This cause is sent to the MS which requests GPRS service in a PLMN which does not offer roaming for GPRS services to that MS.

Cause value = 16 MSC temporarily not reachable

This cause is sent to the MS if it requests a combined GPRS attach or routing area updating in a PLMN where the MSC is temporarily not reachable via the GPRS part of the GSM network.

Cause value = 40 No PDP context activated

This cause is sent to the MS if the MS requests an establishment of the radio access bearers for all active PDP contexts by sending a SERVICE REQUEST message indicating "data" to the network, but the SGSN does not have any active PDP context(s).

CR-Form-v3

## CHANGE REQUEST

⌘ **24.008** **CR CR417** ⌘ rev **2** ⌘ Current version: **3.7.0** ⌘

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

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

**Title:** ⌘ The priority in the CALL PROCEEDING message for eMLPP supporting network

**Source:** ⌘ Ericsson L.M.

**Work item code:** ⌘ TEI

**Date:** ⌘ 2001-04-27

**Category:** ⌘ **F**

**Release:** ⌘ R99

Use one of the following categories:

- F** (essential 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:** ⌘

The eMLPP stage2 (TS 23.067) was updated that the eMLPP-supporting network shall include the assigned priority level in a CALL PROCEEDING message. For this reason, related discriptions of TS 24.008 has to be updated.

**Summary of change:** ⌘

1. A new reference TS 23.067 is added in normative references.
2. Same modification is needed as in the Reason for Change. In addition it is mentioned that when a mobile station connets the eMLPP surrorting R98 or older network, the mobile staion may not receive priority granted conditionally.

**Consequences if not approved:** ⌘

Inconsistency situation will remain between TS24.008 and TS23.067 and TS 24.067.

**Clauses affected:** ⌘ 5.2.1, 9.3.3

**Other specs affected:** ⌘

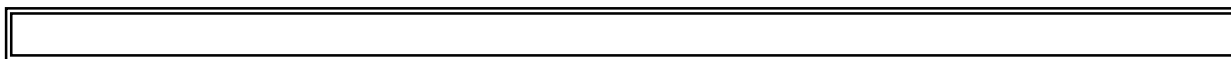
- Other core specifications
- Test specifications
- O&M Specifications

**Other comments:** ⌘ 23.067 CR 009 and 24.067 CR 004 are linked.

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at: [http://www.3gpp.org/3G\\_Specs/CRs.htm](http://www.3gpp.org/3G_Specs/CRs.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://www.3gpp.org/specs/> For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.



---

## 2 Normative references

- [76] 3GPP TS 04.60: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Mobile Station - Base Station System (MS-BSS) interface; Radio Link Control and Medium Access Control (RLC/MAC) layer specification".
- [77] IETF RFC 1034: "Domain names - Concepts and Facilities " (STD 7).
- [78] 3GPP TS 04.65: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Subnetwork Dependent Convergence Protocol (SNDTCP)".
- [79] ITU Recommendation I.460: "Multiplexing, rate adaption and support of existing services".
- [80] 3GPP TS 26.111: "Codec for Circuit Switched Multimedia Telephony Service; Modifications to H.324"
- [81] 3GPP TS 23.107: "3<sup>rd</sup> Generation Partnership Project; Technical Specification Group Services and System Aspects; QoS Concept and Architecture"
- [82] 3GPP TS 03.22: " Digital cellular telecommunications system (Phase 2+); Functions related to Mobile Station (MS) in idle mode and group receive mode".
- [83] 3GPP TS 04.18: "Mobile radio interface layer 3 specification, Radio Resource Control Protocol"
- [84] 3GPP TS 03.55: "Dual Transfer Mode; Stage 2"
- [85] 3GPP TS 23.67: "enhanced Multi-Level Precedence and Pre-emption service (eMLPP) - Stage 2"





## 5.2.1 Mobile originating call establishment

The call control entity of the mobile station initiates establishment of a CC connection by requesting the MM sublayer to establish a mobile originating MM connection and entering the "MM connection pending" state. There are two kinds of a mobile originating call: basic call and emergency call. The request to establish an MM connection shall contain a parameter to specify whether the call is a basic or an emergency call. This information may lead to specific qualities of services to be provided by the MM sublayers. Timer T303 is started when the CM SERVICE REQUEST message is sent.

For mobile stations supporting eMLPP basic calls may optionally have an associated priority level as defined in [3GPP TS 23.067](#)/[GSM 03-67](#). This information may also lead to specified qualities of service to be provided by the MM sublayers.

While being in the "MM connection pending" state, the call entity of the mobile station may cancel the call prior to sending the first call control message according to the rules given in section 4.5.1.7.

The mobile station supporting multicall that is initiating an emergency call shall release one or more existing call to ensure the emergency call can be established if the multicall supported information stored in the mobile station described in section 5.2.1.2 and 5.2.2.1 indicates the network doesn't support multicall and some ongoing calls exists.

Having entered the "MM connection pending" state, upon MM connection establishment, the call control entity of the mobile station sends a setup message to its peer entity. This setup message is

- a SETUP message, if the call to be established is a basic call, and
- an EMERGENCY SETUP message, if the call to be established is an emergency call.

For UMTS speech calls no UMTS speech versions shall be included in *bearer capability IE*. For a ME which supports GSM and UMTS and supports more than GSM speech version 1 then speech versions for GSM shall be included in *Bearer Capability IE*. For a UMTS established call these GSM speech versions shall be used by the network for handover to GSM. For UMTS speech calls default UMTS AMR speech version shall be assumed.

It then enters the "call initiated" state. Timer T303 is not stopped.

The setup message shall contain all the information required by the network to process the call. In particular, the SETUP message shall contain the called party address information. If the mobile station supports multicall, it shall include the Stream Identifier (SI) information element. For the first call i.e. when there are no other ongoing calls the SI value shall be 1.

If timer T303 elapses in the "MM connection pending" state, the MM connection in progress shall be aborted and the user shall be informed about the rejection of the call.

### 5.2.1.1 Call initiation

The "call initiated" state is supervised by timer T303. For normal MO calls, this timer will have already been started after entering the "MM connection pending" state. For network-initiated MO calls this timer will be started in the recall present state as defined in section 5.2.3.4

When the call control entity of the mobile station is in the "call initiated" state and if it receives:

- i) a CALL PROCEEDING message, it shall proceed as described in section 5.2.1.3;
- ii) an ALERTING message, it shall proceed as described in section 5.2.1.5;
- iii) a CONNECT message, it shall proceed as described in section 5.2.1.6;
- iv) a RELEASE COMPLETE message it shall proceed as described in section 5.2.1.2.

Abnormal case:

- If timer T303 elapses in the "call initiated" state before any of the CALL PROCEEDING, ALERTING, CONNECT or RELEASE COMPLETE messages has been received, the clearing procedure described in section 5.4 is performed.

### 5.2.1.2 Receipt of a setup message

In the "null" or "recall present" states, upon receipt of a setup message (a SETUP message or an EMERGENCY SETUP message, see section 5.2.1.1), the call control entity of the network enters the "call initiated" state. It shall then analyse the call information contained in the setup message.

In UMTS, network shall include the SI received in the SETUP message into the RABid and send it back to the mobile station. For RABid see 3GPP TS 25.413. If the network receives the SETUP message with no SI, the network shall set the SI value to 1.

- i) If, following the receipt of the setup message, the call control entity of the network determines that the call information received from the mobile station is invalid (e.g. invalid number), then the network shall initiate call clearing as defined in section 5.4 with one of the following cause values:

- # 1 "unassigned (unallocated) number"
- # 3 "no route to destination"
- # 22 "number changed"
- # 28 "invalid number format (incomplete number)"

- ii) If, following the receipt of the setup message, the call control entity of the network determines that a requested service is not authorized or is not available, it shall initiate call clearing in accordance with section 5.4.2 with one of the following cause values:

- # 8 "operator determined barring",
- # 57 "bearer capability not authorized",
- # 58 "bearer capability not presently available",
- # 63 "service or option not available, unspecified", or
- # 65 "bearer service not implemented".

- iii) Otherwise, the call control entity of the network shall either:

- send a CALL PROCEEDING message to its peer entity to indicate that the call is being processed; and enter the "mobile originating call proceeding" state.
- or: send an ALERTING message to its peer entity to indicate that alerting has been started at the called user side; and enter the "call received" state.
- or: send a CONNECT message to its peer entity to indicate that the call has been accepted at the called user side; and enter the "connect request" state.

The call control entity of the network may insert bearer capability information element(s) in the CALL PROCEEDING message to select options presented by the mobile station in the Bearer Capability information element(s) of the SETUP message. The bearer capability information element(s) shall contain the same parameters as received in the SETUP except those presenting a choice. Where choices were offered, appropriate parameters indicating the results of those choices shall be included.

The CALL\_PROCEEDING message may~~shall~~ also contain the priority of the call in the case where the network supports eMLPP. eMLPP is applied and where the network has assigned a different priority to the call than that requested by the user, or where the user has not requested a priority and the network has assigned a default priority. Mobile stations supporting eMLPP shall indicate this priority level to higher sublayers and store this information for the duration of the call for further action. Mobile stations not supporting eMLPP shall ignore this information element if provided in a CALL PROCEEDING message.

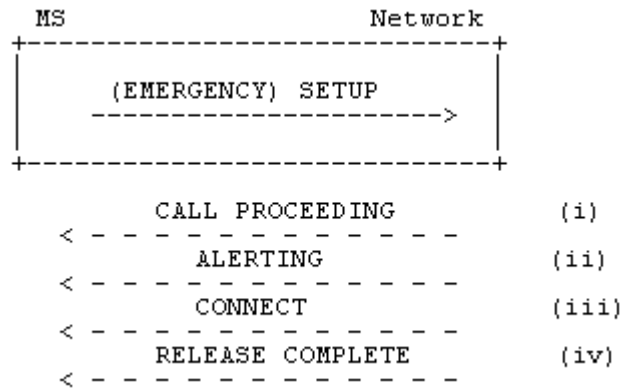
NOTE: If the network supports only R98 or older versions of this protocol and the priority is not included in the CALL PROCEEDING message, this does not imply that the network does not support eMLPP.

- The CALL\_PROCEEDING message shall contain the multicall supported information in the network call control capabilities in the case where the network supports multicall and there are no other ongoing calls to the MS. Mobile stations supporting multicall shall store this information until the call control state for all calls returns to null. Mobile stations not supporting multicall shall ignore this information if provided in a CALL\_PROCEEDING message. If the multicall supported information is not sent in the CALL\_PROCEEDING message, the mobile station supporting multicall shall regard that the network doesn't support multicall.

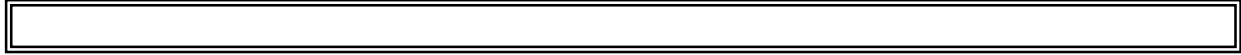
The call control entity of the network having entered the "mobile originating call proceeding" state, the network may initiate the assignment of a traffic channel according to section 5.2.1.9 (early assignment).

For UMTS speech calls no UMTS speech versions shall be included in *bearer capability IE*; default UMTS AMR speech version shall be assumed.

GSM speech versions received by the network in *Bearer Capability IE*. Shall be used by the network for GSM call establishment and handover to GSM. For GSM speech calls where no speech versions are included in *bearer capability IE* the network shall assume GSM speech version 1.



**Figure 5.2/3GPP TS 24.008 Mobile originated call initiation and possible subsequent responses.**



### 9.3.3 Call proceeding

This message is sent by the network to the calling mobile station to indicate that the requested call establishment information has been received, and no more call establishment information will be accepted.

See table 9.57/3GPP TS 24.008.

Message type: CALL PROCEEDING

Significance: local

Direction: network to mobile station

**Table 9.57/3GPP TS 24.008: CALL PROCEEDING message content**

IEI	Information element	Type / Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator 10.2	M	V	1/2
	Transaction identifier	Transaction identifier 10.3.2	M	V	1/2
	Call proceeding message type	Message type 10.4	M	V	1
D-	Repeat Indicator	Repeat Indicator 10.5.4.22	C	TV	1
04	Bearer capability 1	Bearer capability 10.5.4.5	O	TLV	3-16
04	Bearer capability 2	Bearer capability 10.5.4.5	O	TLV	3-16
1C	Facility	Facility 10.5.4.15	O	TLV	2-?
1E	Progress indicator	Progress indicator 10.5.4.21	O	TLV	4
8-	Priority granted	Priority Level 10.5.1.11	O	TV	1
2F	Network Call Control Capabilities	Network Call Control cap. 10.5.4.29	O	TLV	3

#### 9.3.3.1 Repeat indicator

This information element is included if and only if *bearer capability 1 IE* and *bearer capability 2 IE* are both contained in the message.

#### 9.3.3.2 Bearer capability 1 and bearer capability 2

The *bearer capability 1* information element is included if the network has to specify at least one of the negotiable parameters described in 3GPP TS 27.001, or if the *bearer capability 1* information element received in the SETUP message included the "fixed network user rate" parameter.

When the *bearer capability 1* information element is followed by the *bearer capability 2 IE* in the SETUP, the above rule applies to both *bearer capability 1 IE* and *bearer capability 2 IE*. Except those cases identified in 3GPP TS 27.001, if either *bearer capability* needs to be included, both shall be included.

#### 9.3.3.3 Facility

This information element may be used for functional operation of supplementary services.

### 9.3.3.4 Progress Indicator

This information element may be included:

- in order to pass information about the call in progress e.g. in the event of interworking; and/or
- to make the MS attach the user connection for speech.

### 9.3.3.5 Priority granted

The priority field is provided by the network in the case that eMLPP is supported and the priority assigned by the network is not the same as that requested by the mobile station.

### 9.3.3.6 Network Call Control Capabilities

This information shall be included by the network to indicate its call control capabilities if the network supports multicall and there are no other ongoing calls to the MS.

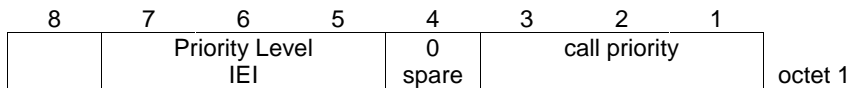


### 10.5.1.11 Priority Level

The purpose of the *Priority Level* is to provide information defining the priority level requested or applied. The *Priority Level* IE may be included in CM\_SERVICE\_REQUEST, CALL\_PROCEEDING and SETUP messages.

The *Priority Level* information element is coded as shown in figure 10.5.11/3GPP TS 24.008 and table 10.5.11/3GPP TS 24.008.

The *Priority Level* is a type 1 information element with 1 octet length.



**Figure 10.5.11/3GPP TS 24.008 Priority Level**

**Table 10.5.11/3GPP TS 24.008 Priority Level**

Call priority (octet 1)			
Bit	3	2	1
0	0	0	no priority applied
0	0	1	call priority level 4
0	1	0	call priority level 3
0	1	1	call priority level 2
1	0	0	call priority level 1
1	0	1	call priority level 0
1	1	0	call priority level B
1	1	1	call priority level A

CR-Form-v3

## CHANGE REQUEST

⌘ **24.008** **CR CR418** ⌘ rev **2** ⌘ Current version: **4.2.0** ⌘

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

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

**Title:** ⌘ The priority in the CALL PROCEEDING message for eMLPP supporting network

**Source:** ⌘ Ericsson L.M.

**Work item code:** ⌘ TEI

**Date:** ⌘ 2001-05-17

**Category:** ⌘ **A**

**Release:** ⌘ REL-4

Use one of the following categories:

- F** (essential 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:** ⌘

The eMLPP stage2 (TS 23.067) was updated that the eMLPP-supporting network shall include the assigned priority level in a CALL PROCEEDING message. For this reason, related discriptions of TS 24.008 has to be updated.

**Summary of change:** ⌘

1. A new reference TS 23.067 is added in normative references.
2. Same modification is needed as in the Reason for Change. In addition it is mentioned that when a mobile station connets the eMLPP surrorting R98 or older network, the mobile staion may not receive priority granted conditionally.

**Consequences if not approved:** ⌘

Inconsistency situation will remain between TS24.008 and TS23.067 and TS 24.067.

**Clauses affected:** ⌘ 5.2.1, 9.3.3

**Other specs affected:** ⌘

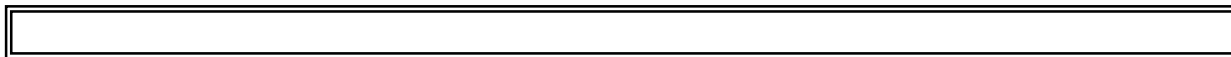
- Other core specifications
- Test specifications
- O&M Specifications

**Other comments:** ⌘ 23.067 CR 010 and 24.067 CR 005 are linked.

**How to create CRs using this form:**

Comprehensive information and tips about how to create CRs can be found at: [http://www.3gpp.org/3G\\_Specs/CRs.htm](http://www.3gpp.org/3G_Specs/CRs.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://www.3gpp.org/specs/> For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.



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## 2 Normative references

- [76] 3GPP TS 04.60: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Mobile Station - Base Station System (MS-BSS) interface; Radio Link Control and Medium Access Control (RLC/MAC) layer specification".
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- [82] 3GPP TS 03.22: " Digital cellular telecommunications system (Phase 2+); Functions related to Mobile Station (MS) in idle mode and group receive mode".
- [83] 3GPP TS 04.18: "Mobile radio interface layer 3 specification, Radio Resource Control Protocol"
- [84] 3GPP TS 03.55: "Dual Transfer Mode; Stage 2"
- [85] 3GPP TS 23.67: "enhanced Multi-Level Precedence and Pre-emption service (eMLPP) - Stage 2"





## 5.2.1 Mobile originating call establishment

The call control entity of the mobile station initiates establishment of a CC connection by requesting the MM sublayer to establish a mobile originating MM connection and entering the "MM connection pending" state. There are two kinds of a mobile originating call: basic call and emergency call. The request to establish an MM connection shall contain a parameter to specify whether the call is a basic or an emergency call. This information may lead to specific qualities of services to be provided by the MM sublayers. Timer T303 is started when the CM SERVICE REQUEST message is sent.

For mobile stations supporting eMLPP basic calls may optionally have an associated priority level as defined in [3GPP TS 23.067](#)/[GSM 03-67](#). This information may also lead to specified qualities of service to be provided by the MM sublayers.

While being in the "MM connection pending" state, the call entity of the mobile station may cancel the call prior to sending the first call control message according to the rules given in section 4.5.1.7.

The mobile station supporting multicall that is initiating an emergency call shall release one or more existing call to ensure the emergency call can be established if the multicall supported information stored in the mobile station described in section 5.2.1.2 and 5.2.2.1 indicates the network doesn't support multicall and some ongoing calls exists.

Having entered the "MM connection pending" state, upon MM connection establishment, the call control entity of the mobile station sends a setup message to its peer entity. This setup message is

- a SETUP message, if the call to be established is a basic call, and
- an EMERGENCY SETUP message, if the call to be established is an emergency call.

For UMTS speech calls no UMTS speech versions shall be included in *bearer capability IE*. For a ME which supports GSM and UMTS and supports more than GSM speech version 1 then speech versions for GSM shall be included in *Bearer Capability IE*. For a UMTS established call these GSM speech versions shall be used by the network for handover to GSM. For UMTS speech calls default UMTS AMR speech version shall be assumed.

It then enters the "call initiated" state. Timer T303 is not stopped.

The setup message shall contain all the information required by the network to process the call. In particular, the SETUP message shall contain the called party address information. If the mobile station supports multicall, it shall include the Stream Identifier (SI) information element. For the first call i.e. when there are no other ongoing calls the SI value shall be 1.

If timer T303 elapses in the "MM connection pending" state, the MM connection in progress shall be aborted and the user shall be informed about the rejection of the call.

### 5.2.1.1 Call initiation

The "call initiated" state is supervised by timer T303. For normal MO calls, this timer will have already been started after entering the "MM connection pending" state. For network-initiated MO calls this timer will be started in the recall present state as defined in section 5.2.3.4

When the call control entity of the mobile station is in the "call initiated" state and if it receives:

- i) a CALL PROCEEDING message, it shall proceed as described in section 5.2.1.3;
- ii) an ALERTING message, it shall proceed as described in section 5.2.1.5;
- iii) a CONNECT message, it shall proceed as described in section 5.2.1.6;
- iv) a RELEASE COMPLETE message it shall proceed as described in section 5.2.1.2.

Abnormal case:

- If timer T303 elapses in the "call initiated" state before any of the CALL PROCEEDING, ALERTING, CONNECT or RELEASE COMPLETE messages has been received, the clearing procedure described in section 5.4 is performed.

### 5.2.1.2 Receipt of a setup message

In the "null" or "recall present" states, upon receipt of a setup message (a SETUP message or an EMERGENCY SETUP message, see section 5.2.1.1), the call control entity of the network enters the "call initiated" state. It shall then analyse the call information contained in the setup message.

In UMTS, network shall include the SI received in the SETUP message into the RABid and send it back to the mobile station. For RABid see 3GPP TS 25.413. If the network receives the SETUP message with no SI, the network shall set the SI value to 1.

- i) If, following the receipt of the setup message, the call control entity of the network determines that the call information received from the mobile station is invalid (e.g. invalid number), then the network shall initiate call clearing as defined in section 5.4 with one of the following cause values:

- # 1 "unassigned (unallocated) number"
- # 3 "no route to destination"
- # 22 "number changed"
- # 28 "invalid number format (incomplete number)"

- ii) If, following the receipt of the setup message, the call control entity of the network determines that a requested service is not authorized or is not available, it shall initiate call clearing in accordance with section 5.4.2 with one of the following cause values:

- # 8 "operator determined barring",
- # 57 "bearer capability not authorized",
- # 58 "bearer capability not presently available",
- # 63 "service or option not available, unspecified", or
- # 65 "bearer service not implemented".

- iii) Otherwise, the call control entity of the network shall either:

- send a CALL PROCEEDING message to its peer entity to indicate that the call is being processed; and enter the "mobile originating call proceeding" state.
- or: send an ALERTING message to its peer entity to indicate that alerting has been started at the called user side; and enter the "call received" state.
- or: send a CONNECT message to its peer entity to indicate that the call has been accepted at the called user side; and enter the "connect request" state.

The call control entity of the network may insert bearer capability information element(s) in the CALL PROCEEDING message to select options presented by the mobile station in the Bearer Capability information element(s) of the SETUP message. The bearer capability information element(s) shall contain the same parameters as received in the SETUP except those presenting a choice. Where choices were offered, appropriate parameters indicating the results of those choices shall be included.

The CALL\_PROCEEDING message may~~shall~~ also contain the priority of the call in the case where ~~the network supports eMLPP. eMLPP is applied and where the network has assigned a different priority to the call than that requested by the user, or where the user has not requested a priority and the network has assigned a default priority.~~ Mobile stations supporting eMLPP shall indicate this priority level to higher sublayers and store this information for the duration of the call for further action. Mobile stations not supporting eMLPP shall ignore this information element if provided in a CALL PROCEEDING message.

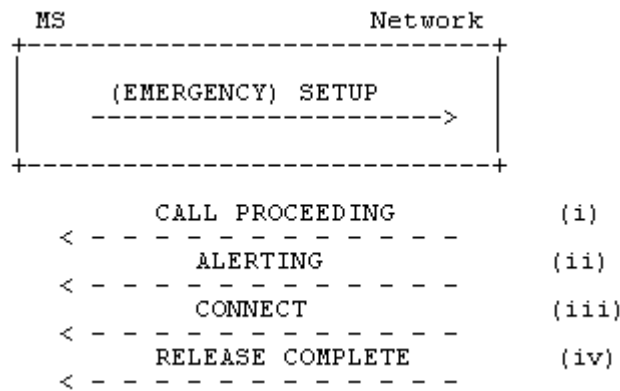
NOTE: If the network supports only R98 or older versions of this protocol and the priority is not included in the CALL PROCEEDING message, this does not imply that the network does not support eMLPP.

- The CALL\_PROCEEDING message shall contain the multicall supported information in the network call control capabilities in the case where the network supports multicall and there are no other ongoing calls to the MS. Mobile stations supporting multicall shall store this information until the call control state for all calls returns to null. Mobile stations not supporting multicall shall ignore this information if provided in a CALL\_PROCEEDING message. If the multicall supported information is not sent in the CALL\_PROCEEDING message, the mobile station supporting multicall shall regard that the network doesn't support multicall.

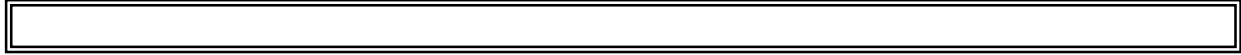
The call control entity of the network having entered the "mobile originating call proceeding" state, the network may initiate the assignment of a traffic channel according to section 5.2.1.9 (early assignment).

For UMTS speech calls no UMTS speech versions shall be included in *bearer capability IE*; default UMTS AMR speech version shall be assumed.

GSM speech versions received by the network in *Bearer Capability IE*. Shall be used by the network for GSM call establishment and handover to GSM. For GSM speech calls where no speech versions are included in *bearer capability IE* the network shall assume GSM speech version 1.



**Figure 5.2/3GPP TS 24.008 Mobile originated call initiation and possible subsequent responses.**



### 9.3.3 Call proceeding

This message is sent by the network to the calling mobile station to indicate that the requested call establishment information has been received, and no more call establishment information will be accepted.

See table 9.57/3GPP TS 24.008.

Message type: CALL PROCEEDING

Significance: local

Direction: network to mobile station

**Table 9.57/3GPP TS 24.008: CALL PROCEEDING message content**

IEI	Information element	Type / Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator 10.2	M	V	1/2
	Transaction identifier	Transaction identifier 10.3.2	M	V	1/2
	Call proceeding message type	Message type 10.4	M	V	1
D-	Repeat Indicator	Repeat Indicator 10.5.4.22	C	TV	1
04	Bearer capability 1	Bearer capability 10.5.4.5	O	TLV	3-16
04	Bearer capability 2	Bearer capability 10.5.4.5	O	TLV	3-16
1C	Facility	Facility 10.5.4.15	O	TLV	2-?
1E	Progress indicator	Progress indicator 10.5.4.21	O	TLV	4
8-	Priority granted	Priority Level 10.5.1.11	O	TV	1
2F	Network Call Control Capabilities	Network Call Control cap. 10.5.4.29	O	TLV	3

#### 9.3.3.1 Repeat indicator

This information element is included if and only if *bearer capability 1 IE* and *bearer capability 2 IE* are both contained in the message.

#### 9.3.3.2 Bearer capability 1 and bearer capability 2

The *bearer capability 1* information element is included if the network has to specify at least one of the negotiable parameters described in 3GPP TS 27.001, or if the *bearer capability 1* information element received in the SETUP message included the "fixed network user rate" parameter.

When the *bearer capability 1* information element is followed by the *bearer capability 2 IE* in the SETUP, the above rule applies to both *bearer capability 1 IE* and *bearer capability 2 IE*. Except those cases identified in 3GPP TS 27.001, if either *bearer capability* needs to be included, both shall be included.

#### 9.3.3.3 Facility

This information element may be used for functional operation of supplementary services.

### 9.3.3.4 Progress Indicator

This information element may be included:

- in order to pass information about the call in progress e.g. in the event of interworking; and/or
- to make the MS attach the user connection for speech.

### 9.3.3.5 Priority granted

The priority field is provided by the network in the case that eMLPP is supported. ~~used and the priority assigned by the network is not the same as that requested by the mobile station.~~

### 9.3.3.6 Network Call Control Capabilities

This information shall be included by the network to indicate its call control capabilities if the network supports multicall. ~~and there are no other ongoing calls to the MS.~~

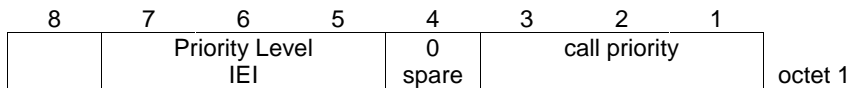


## 10.5.1.11 Priority Level

The purpose of the *Priority Level* is to provide information defining the priority level requested or applied. The *Priority Level* IE may be included in CM\_SERVICE\_REQUEST, CALL\_PROCEEDING and SETUP messages.

The *Priority Level* information element is coded as shown in figure 10.5.11/3GPP TS 24.008 and table 10.5.11/3GPP TS 24.008.

The *Priority Level* is a type 1 information element with 1 octet length.



**Figure 10.5.11/3GPP TS 24.008 Priority Level**

**Table 10.5.11/3GPP TS 24.008 Priority Level**

Call priority (octet 1)			
Bit	3	2	1
0	0	0	no priority applied
0	0	1	call priority level 4
0	1	0	call priority level 3
0	1	1	call priority level 2
1	0	0	call priority level 1
1	0	1	call priority level 0
1	1	0	call priority level B
1	1	1	call priority level A

CR-Form-v3

## CHANGE REQUEST

⌘ **24.008 CR 420** ⌘ rev **1** ⌘ Current version: **3.7.0** ⌘

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

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

<b>Title:</b>	⌘ Handling of MM reject causes 2, 3 and 6 by mobile stations
<b>Source:</b>	⌘ Vodafone
<b>Work item code:</b>	⌘ TEI <span style="float: right;"><b>Date:</b> ⌘ 16-May-2001</span>
<b>Category:</b>	⌘ <b>F</b> <span style="float: right;"><b>Release:</b> ⌘ R99</span>
<p>Use <u>one</u> of the following categories:</p> <p><b>F</b> (essential 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)</p> <p>Detailed explanations of the above categories can be found in 3GPP TR 21.900.</p> <p>Use <u>one</u> of the following releases:</p> <p><b>2</b> (GSM Phase 2)  <b>R96</b> (Release 1996)  <b>R97</b> (Release 1997)  <b>R98</b> (Release 1998)  <b>R99</b> (Release 1999)  <b>REL-4</b> (Release 4)  <b>REL-5</b> (Release 5)</p>	

<b>Reason for change:</b>	⌘ During the development of the GPRS mobility management protocol it was a common sense, that the MM procedures shall not impact the GMM context. One exception to this was defined if the MM authentication procedure is rejected by the network. This exception was explicitly stated in sec. 4.1.1.2.1 and 4.1.1.2.2. As at least one company strongly rejected any GPRS specific changes in the MM specific sections of 04.08 which is probably the reason why the spec. is now ambiguous concerning the meaning of the term " <i>consider the SIM as invalid until switch-off or the SIM is removed</i> " in the MM procedure descriptions.
<b>Summary of change:</b>	⌘ The CR clarifies that no MM procedure except the MM authentication has any impact on the GMM context in the MS.
<b>Consequences if not approved:</b>	⌘ MS implementations which disables the PS if cause code #2 is received, even this is not requested by the network.

<b>Clauses affected:</b>	⌘
<b>Other specs affected:</b>	⌘ <input type="checkbox"/> Other core specifications ⌘ <input type="checkbox"/> Test specifications <input type="checkbox"/> O&M Specifications
<b>Other comments:</b>	⌘

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- 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.

## 4.1.1.2 MM-GMM co-ordination for GPRS MS's

### 4.1.1.2.1 GPRS MS operating in mode A or B in a network that operates in mode I

If the network operates in mode I, GPRS MSs that operate in mode A or B and wish to be or are simultaneously IMSI attached for GPRS and non-GPRS services, shall use the combined GPRS attach and the combined and periodic routing area updating procedures instead of the corresponding MM specific procedures IMSI attach and normal and periodic location area updating.

NOTE: A GPRS MS operating in mode A or B in a network that operates in mode I, shall perform the combined GPRS attach or routing area update procedure regardless the value of the ATT flag.

If a GPRS MS is operating in mode A or B in a network that operates in mode I the IMSI detach shall be performed by the GMM using the combined GPRS detach procedure

NOTE: A GPRS MS operating in mode A or B in a network that operates in mode I, shall perform the combined GPRS detach procedure regardless the value of the ATT flag.

A GPRS MS operating in mode A or B in network that operates in mode I, uses the combined GMM specific procedures in place of the MM specific procedures, so all conditions describing when to trigger a MM specific procedure listed in subsections 4.3 and 4.4 shall not apply.

A GPRS MS operating in mode A or B in a network that operates in mode I should not use any MM timers relating to MM specific procedures, (e.g T3210, T3211, T3212, T3213) except in some error and abnormal cases. If the MM timers are already running, the MS should not react on the expiration of the timers.

NOTE: Whenever GMM performs a combined GMM procedure, a GPRS MS enters the MM state MM LOCATION UPDATING PENDING in order to prevent the MM to perform a location update procedure.

If the authentication procedure is performed by MM and the authentication is rejected by the network (i.e upon receive of AUTHENTICATION REJECT), the MS shall in addition set the GPRS update status to GU3 ROAMING NOT ALLOWED and shall, if available, delete the P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number stored. The SIM shall be considered as invalid for GPRS and non-GPRS services until switching off or the SIM is removed. The MS shall abort any GMM procedure and shall enter state GMM-DEREGISTERED.

### 4.1.1.2.2 GPRS MS operating in mode A or B in a network that operates in mode II or III

If the network operates in mode II or III, a GPRS MSs that operate in mode A or B and wish to be or are simultaneously IMSI attached for GPRS and non-GPRS services, shall use the MM specific procedures listed in subsections 4.3 and 4.4 and the GMM specific procedures listed in subsections 4.7.3, 4.7.4 and 4.7.5. The applicability of periodic location updating is further specified in section 4.4.2 and the periodic routing area updating is specified in section 4.7.2.2.

If the authentication procedure is performed by MM and the authentication is rejected by the network (i.e upon receive of AUTHENTICATION REJECT), the MS shall in addition set the GPRS update status to GU3 ROAMING NOT ALLOWED and shall, if available, delete the P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number stored. The SIM shall be considered as **invalid for GPRS and non-GPRS services** until switching off or the SIM is removed. The MS shall abort any GMM procedure and shall enter state GMM-DEREGISTERED.



#### 4.3.2.5 Authentication not accepted by the network

If authentication fails, i.e. if the response is not valid, the network may distinguish between the two different ways of identification used by the mobile station:

- the TMSI was used;
- the IMSI was used.

If the TMSI has been used, the network may decide to initiate the identification procedure. If the IMSI given by the mobile station then differs from the one the network had associated with the TMSI, the authentication should be restarted with the correct parameters. If the IMSI provided by the MS is the expected one (i.e. authentication has really failed), the network should proceed as described below.

If the IMSI has been used, or the network decides not to try the identification procedure, an AUTHENTICATION REJECT message should be transferred to the mobile station.

After having sent this message, all MM connections in progress (if any) are released and the network should initiate the RR connection release procedure described in section 3.5.of 04.18 (GSM) or in 3GPP TS 25.331 (UMTS).

Upon receipt of an AUTHENTICATION REJECT message, the mobile station shall set the update status in the SIM to U3 ROAMING NOT ALLOWED, delete from the SIM the stored TMSI, LAI and ciphering key sequence number. The SIM shall be considered as invalid until switching off or the SIM is removed.

If the AUTHENTICATION REJECT message is received in the state IMSI DETACH INITIATED the mobile station shall follow section 4.3.4.3.

If the AUTHENTICATION REJECT message is received in any other state the mobile station shall abort any MM specific, MM connection establishment or call re-establishment procedure, stop any of the timers T3210 or T3230 (if running), release all MM connections (if any), start timer T3240 and enter the state WAIT FOR NETWORK COMMAND, expecting the release of the RR connection. If the RR connection is not released within a given time controlled by the timer T3240, the mobile station shall abort the RR connection. In both cases, either after a RR connection release triggered from the network side or after a RR connection abort requested by the MS-side, the MS enters state MM IDLE, substate NO IMSI. If the MS has a separate ongoing RR connection to a different core network node, it shall consider this separate connection as still being good.

#### 4.4.4.7 Location updating not accepted by the network

If the location updating cannot be accepted the network sends a LOCATION UPDATING REJECT message to the mobile station. The mobile station receiving a LOCATION UPDATING REJECT message shall stop the timer T3210, store the reject cause, delete the list of "equivalent PLMNs", start T3240, enter state LOCATION UPDATING REJECTED await the release of the RR connection triggered by the network. Upon the release of the RR connection the mobile station shall take the following actions depending on the stored reject cause:

# 2: IMSI unknown in HLR;

# 3: Illegal MS; or

# 6: Illegal ME.

The mobile station shall set the update status to ROAMING NOT ALLOWED (and store it in the SIM according to section 4.1.2.2), and delete any TMSI, stored LAI and ciphering key sequence number and shall consider the SIM as invalid for non-GPRS services until switch-off or the SIM is removed.

# 11: PLMN not allowed;

# 12: Location Area not allowed; or

# 13: Roaming not allowed in this location area.

The mobile station shall delete any LAI, TMSI and ciphering key sequence number stored in the SIM, reset the attempt counter, set the update status to ROAMING NOT ALLOWED (and store it in the SIM according to section 4.1.2.2). The mobile station shall store the LAI or the PLMN identity in the suitable forbidden list, i.e. in the "forbidden PLMN list" for cause #11, in the list of "forbidden location areas for regional provision of service" for cause #12, and in the list of "forbidden location areas for roaming" for cause #13. In addition, the MS will memorize if cause #13 was received, so to perform a PLMN selection instead of a cell selection when back to the MM IDLE state.

Other values are considered as abnormal cases and the specification of the mobile station behaviour in those cases is given in section 4.4.4.9.

## 4.5.1 MM connection establishment

### 4.5.1.1 MM connection establishment initiated by the mobile station

Upon request of a CM entity to establish an MM connection the MM sublayer first decides whether to accept, delay, or reject this request:

- An MM connection establishment may only be initiated by the mobile station when the following conditions are fulfilled:
  - Its update status is UPDATED.
  - The MM sublayer is in one of the states MM IDLE or MM connection active but not in MM connection active (Group call).

An exception from this general rule exists for emergency calls (see section 4.5.1.5). A further exception is defined in the following clause.

- If an MM specific procedure is running at the time the request from the CM sublayer is received, and the LOCATION UPDATING REQUEST message has been sent, the request will either be rejected or delayed, depending on implementation, until the MM specific procedure is finished and, provided that the network has not sent a "follow-on proceed" indication, the RR connection is released. If the LOCATION UPDATING REQUEST message has not been sent, the mobile station may include a "follow-on request" indicator in the message. The mobile station shall then delay the request until the MM specific procedure is completed, when it may be given the opportunity by the network to use the RR connection: see section 4.4.4.6.

In order to establish an MM connection, the mobile station proceeds as follows:

- a) If no RR connection exists, the MM sublayer requests the RR sublayer to establish an RR connection and enters MM sublayer state WAIT FOR RR CONNECTION (MM CONNECTION). This request contains an establishment cause and a CM SERVICE REQUEST message. When the establishment of an RR connection is indicated by the RR sublayer, the MM sublayer of the mobile station starts timer T3230, gives an indication to the CM entity that requested the MM connection establishment, and enters MM sublayer state WAIT FOR OUTGOING MM CONNECTION.
- b) If an RR connection is available, the MM sublayer of the mobile station sends a CM SERVICE REQUEST message to the network, starts timer T3230, gives an indication to the CM entity that requested the MM connection establishment, and enters:
  - MM sublayer state WAIT FOR OUTGOING MM CONNECTION, if no MM connection is active;
  - MM sublayer state WAIT FOR ADDITIONAL OUTGOING MM CONNECTION, if at least one MM connection is active;
  - If an RR connection exists but the mobile station is in the state WAIT FOR NETWORK COMMAND then any requests from the CM layer that are received will either be rejected or delayed until this state is left.
- c) Only applicable for mobile stations supporting VGCS talking:

If a mobile station which is in the MM sublayer state MM IDLE, service state RECEIVING GROUP CALL (NORMAL SERVICE), receives a request from the GCC sublayer to perform an uplink access, the MM sublayer requests the RR sublayer to perform an uplink access procedure and enters MM sublayer state WAIT FOR RR CONNECTION (GROUP TRANSMIT MODE).

When a successful uplink access is indicated by the RR sublayer, the MM sublayer of the mobile station gives an indication to the GCC sublayer and enters MM sublayer state MM CONNECTION ACTIVE (GROUP TRANSMIT MODE).

When an uplink access reject is indicated by the RR sublayer, the MM sublayer of the mobile station gives an indication to the GCC sublayer and enters the MM sublayer state MM IDLE, service state RECEIVING GROUP CALL (NORMAL SERVICE).

In the network, if an uplink access procedure is performed, the RR sublayer in the network provides an indication to the MM sublayer together with the mobile subscriber identity received in the TALKER

INDICATION message. The network shall then enter the MM sublayer state MM CONNECTION ACTIVE (GROUP TRANSMIT MODE).

The CM SERVICE REQUEST message contains the

- mobile identity according to section 10.5.1.4;
- mobile station classmark 2;
- ciphering key sequence number; and
- CM service type identifying the requested type of transaction (e.g. mobile originating call establishment, emergency call establishment, short message service, supplementary service activation, location services)

A MS supporting eMLPP may optionally include a priority level in the CM SERVICE REQUEST message.

A collision may occur when a CM layer message is received by the mobile station in MM sublayer state WAIT FOR OUTGOING MM CONNECTION or in WAIT FOR ADDITIONAL OUTGOING MM CONNECTION. In this case the MM sublayer in the MS shall establish a new MM connection for the incoming CM message as specified in 4.5.1.3.

Upon receiving a CM SERVICE REQUEST message, the network shall analyse its content. The type of semantic analysis may depend on other on going MM connection(s). Depending on the type of request and the current status of the RR connection, the network may start any of the MM common procedures and RR procedures.

In GSM, the network may initiate the classmark interrogation procedure, for example, to obtain further information on the mobile station's encryption capabilities.

The identification procedure (see section 4.3.3) may be invoked for instance if a TMSI provided by the mobile station is not recognized.

The network may invoke the authentication procedure (see section 4.3.2) depending on the CM service type.

In GSM, the network decides also if the ciphering mode setting procedure shall be invoked (see section 3.4.7 in GSM 04.18).

In UMTS, the network decides also if the security mode control procedure shall be invoked (see section 8.1.10 in 3GPP TS 25.331).

NOTE: If the CM\_SERVICE\_REQUEST message contains a priority level the network may use this to perform queuing and pre-emption as defined in 3GPP TS 23.067.

In GSM, an indication from the RR sublayer that the ciphering mode setting procedure is completed, or reception of a CM SERVICE ACCEPT message, shall be treated as a service acceptance indication by the mobile station.

In UMTS, an indication from the RR sublayer that the security mode control procedure is completed, or reception of a CM SERVICE ACCEPT message, shall be treated as a service acceptance indication by the mobile station. The procedures in section 4.1.1.1.1 shall always have precedence over this section.

In UMTS, during a MM connection establishment for all services, except for emergency call (see chapter 4.1.1.1.1), the security mode control procedure with activation of integrity protection shall be invoked by the network unless integrity protection is already started (see chapter 4.1.1.1.1).

The MM connection establishment is completed, timer T3230 shall be stopped, the CM entity that requested the MM connection shall be informed, and MM sublayer state MM CONNECTION ACTIVE is entered. The MM connection is considered to be active.

If the service request cannot be accepted, the network returns a CM SERVICE REJECT message to the mobile station.

The reject cause information element (see 10.5.3.6 and Annex G) indicates the reason for rejection. The following cause values may apply:

#4 : IMSI unknown in VLR

#6 : Illegal ME

#17 : Network failure

#22 : Congestion

#32 : Service option not supported

#33 : Requested service option not subscribed

#34 : Service option temporarily out of order

If no other MM connection is active, the network may start the RR connection release (see section 3.5) when the CM SERVICE REJECT message is sent.

If a CM SERVICE REJECT message is received by the mobile station, timer T3230 shall be stopped, the requesting CM sublayer entity informed. Then the mobile station shall proceed as follows:

- If the cause value is not #4 or #6 the MM sublayer returns to the previous state (the state where the request was received). Other MM connections shall not be affected by the CM SERVICE REJECT message.
- If cause value #4 is received, the mobile station aborts any MM connection, deletes any TMSI, LAI and ciphering key sequence number in the SIM, changes the update status to NOT UPDATED (and stores it in the SIM according to section 4.1.2.2), and enters the MM sublayer state WAIT FOR NETWORK COMMAND. If subsequently the RR connection is released or aborted, this will force the mobile station to initiate a normal location updating). Whether the CM request shall be memorized during the location updating procedure, is a choice of implementation.
- If cause value #6 is received, the mobile station aborts any MM connection, deletes any TMSI, LAI and ciphering key sequence number in the SIM, changes the update status to ROAMING NOT ALLOWED (and stores it in the SIM according to section 4.1.2.2), and enters the MM sublayer state WAIT FOR NETWORK COMMAND. The mobile station shall consider the SIM as invalid for non-GPRS services until switch-off or the SIM is removed.

#### 4.5.1.6.1 Call re-establishment, initiation by the mobile station

NOTE: The network is unable to initiate call re-establishment.

If at least one request to re-establish an MM connection is received from a CM entity as a response to the indication that the MM connection is interrupted (see 4.5.2.3.) the mobile station initiates the call re-establishment procedure. If several CM entities request re-establishment only one re-establishment procedure is initiated. If any CM entity requests re-establishment, then re-establishment of all transactions belonging to all Protocol Discriminators that permit Call Re-establishment shall be attempted.

Upon request of a CM entity to re-establish an MM connection the MM sublayer requests the RR sublayer to establish an RR connection and enters MM sublayer state WAIT FOR REESTABLISH. This request contains an establishment cause and a CM RE-ESTABLISHMENT REQUEST message. When the establishment of an RR connection is indicated by the RR sublayer, the MM sublayer of the mobile station starts timer T3230, gives an indication to all CM entities that are being re-established, and remains in the MM sublayer state WAIT FOR REESTABLISH.

The CM RE-ESTABLISHMENT REQUEST message contains the

- mobile identity according to section 10.5.1.4;
- mobile station classmark 2;
- ciphering key sequence number.

NOTE: Whether or not a CM entity can request re-establishment depends upon the Protocol Discriminator. The specifications for Short Message Service (GSM 04.11), Call Independent Supplementary Services (TS 24.010) and Location Services (TS 24.071) do not currently specify any re-establishment procedures.

Upon receiving a CM RE-ESTABLISHMENT REQUEST message, the network shall analyse its content. Depending on the type of request, the network may start any of the MM common procedures and RR procedures.

The network may initiate the classmark interrogation procedure, for example, to obtain further information on the mobile station's encryption capabilities.

The identification procedure (see section 4.3.3) may be invoked.

The network may invoke the authentication procedure (see section 4.3.2).

In GSM, the network decides if the security mode setting procedure shall be invoked (see GSM 04.18 section 3.4.7).

An indication from the RR sublayer that the security mode setting procedure is completed, or reception of a CM SERVICE ACCEPT message, shall be treated as a service acceptance indication by the mobile station.

In UMTS, the network decides if the security mode control procedure shall be invoked (see section 8.1.10 in 3GPP TS 25.331). An indication from the RR sublayer that the security mode control procedure is completed, or reception of a CM SERVICE ACCEPT message, shall be treated as a service acceptance indication by the mobile station.

The MM connection re-establishment is completed, timer T3230 shall be stopped, all CM entities associated with the re-establishment shall be informed, and MM sublayer state MM CONNECTION ACTIVE is re-entered. All the MM connections are considered to be active.

If the network cannot associate the re-establishment request with any existing call for that mobile station, a CM SERVICE REJECT message is returned with the reject cause:

#38 "call cannot be identified"

If call re-establishment cannot be performed for other reasons, a CM SERVICE REJECT is returned, the appropriate reject cause may be any of the following (see annex G):

# 4 "IMSI unknown in VLR";

# 6 "illegal ME";

#17 "network failure";

#22 "congestion";

- #32 "service option not supported";
- #34 "service option temporarily out of order".

Whatever the reject cause a mobile station receiving a CM SERVICE REJECT as a response to the CM RE-ESTABLISHMENT REQUEST shall stop T3230, release all MM connections and proceed as described in section 4.5.3.1. In addition:

- if cause value #4 is received, the mobile station deletes any TMSI, LAI and ciphering key sequence number in the SIM, changes the update status to NOT UPDATED (and stores it in the SIM according to section 4.1.2.2), and enters the MM sublayer state WAIT FOR NETWORK COMMAND. If subsequently the RR connection is released or aborted, this will force the mobile station to initiate a normal location updating). The CM re-establishment request shall not be memorized during the location updating procedure.
- if cause value #6 is received, the mobile station deletes any TMSI, LAI and ciphering key sequence number in the SIM, changes the update status to ROAMING NOT ALLOWED (and stores it in the SIM according to section 4.1.2.2), and enters the MM sublayer state WAIT FOR NETWORK COMMAND. The MS shall consider the SIM as invalid for non-GPRS services until switch-off or the SIM is removed.

---

## G.1 Causes related to MS identification

Cause value = 2 IMSI unknown in HLR

This cause is sent to the MS if the MS is not known (registered) in the HLR. This cause code does not affect operation of the GPRS service, although it may be used by a GMM procedure.

Cause value = 3 Illegal MS

This cause is sent to the MS when the network refuses service to the MS either because an identity of the MS is not acceptable to the network or because the MS does not pass the authentication check, i.e. the SRES received from the MS is different from that generated by the network. When used by an MM procedure, except the authentication procedure, this cause does not affect operation of the GPRS service.

Cause value = 4 IMSI unknown in VLR

This cause is sent to the MS when the given IMSI is not known at the VLR.

Cause value = 5 IMEI not accepted

This cause is sent to the MS if the network does not accept emergency call establishment using an IMEI.

Cause value = 6 Illegal ME

This cause is sent to the MS if the ME used is not acceptable to the network, e.g. blacklisted. When used by an MM procedure, this cause does not affect operation of the GPRS service.

CR-Form-v3

## CHANGE REQUEST

⌘ **24.008 CR 421** ⌘ rev **1** ⌘ Current version: **4.2.0** ⌘

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

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

<b>Title:</b>	⌘ Handling of MM reject causes 2, 3 and 6 by mobile stations
<b>Source:</b>	⌘ Vodafone
<b>Work item code:</b>	⌘ TEI <span style="float: right;"><b>Date:</b> ⌘ 16-May-2001</span>
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<b>Consequences if not approved:</b>	⌘ MS implementations which disables the PS if cause code #2 is received, even this is not requested by the network.

<b>Clauses affected:</b>	⌘
<b>Other specs affected:</b>	⌘ <input type="checkbox"/> Other core specifications ⌘ <input type="checkbox"/> Test specifications <input type="checkbox"/> O&M Specifications
<b>Other comments:</b>	⌘

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NOTE: A GPRS MS operating in mode A or B in a network that operates in mode I, shall perform the combined GPRS attach or routing area update procedure regardless the value of the ATT flag.

If a GPRS MS is operating in mode A or B in a network that operates in mode I the IMSI detach shall be performed by the GMM using the combined GPRS detach procedure

NOTE: A GPRS MS operating in mode A or B in a network that operates in mode I, shall perform the combined GPRS detach procedure regardless the value of the ATT flag.

A GPRS MS operating in mode A or B in network that operates in mode I, uses the combined GMM specific procedures in place of the MM specific procedures, so all conditions describing when to trigger a MM specific procedure listed in subsections 4.3 and 4.4 shall not apply.

A GPRS MS operating in mode A or B in a network that operates in mode I should not use any MM timers relating to MM specific procedures, (e.g T3210, T3211, T3212, T3213) except in some error and abnormal cases. If the MM timers are already running, the MS should not react on the expiration of the timers.

NOTE: Whenever GMM performs a combined GMM procedure, a GPRS MS enters the MM state MM LOCATION UPDATING PENDING in order to prevent the MM to perform a location update procedure.

If the authentication procedure is performed by MM and the authentication is rejected by the network (i.e upon receive of AUTHENTICATION REJECT), the MS shall in addition set the GPRS update status to GU3 ROAMING NOT ALLOWED and shall, if available, delete the P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number stored. The SIM shall be considered as invalid for GPRS and non-GPRS services until switching off or the SIM is removed. The MS shall abort any GMM procedure and shall enter state GMM-DEREGISTERED.

### 4.1.1.2.2 GPRS MS operating in mode A or B in a network that operates in mode II or III

If the network operates in mode II or III, a GPRS MSs that operate in mode A or B and wish to be or are simultaneously IMSI attached for GPRS and non-GPRS services, shall use the MM specific procedures listed in subsections 4.3 and 4.4 and the GMM specific procedures listed in subsections 4.7.3, 4.7.4 and 4.7.5. The applicability of periodic location updating is further specified in section 4.4.2 and the periodic routing area updating is specified in section 4.7.2.2.

If the authentication procedure is performed by MM and the authentication is rejected by the network (i.e upon receive of AUTHENTICATION REJECT), the MS shall in addition set the GPRS update status to GU3 ROAMING NOT ALLOWED and shall, if available, delete the P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number stored. The SIM shall be considered as **invalid for GPRS and non-GPRS services** until switching off or the SIM is removed. The MS shall abort any GMM procedure and shall enter state GMM-DEREGISTERED.

#### 4.3.2.5 Authentication not accepted by the network

If authentication fails, i.e. if the response is not valid, the network may distinguish between the two different ways of identification used by the mobile station:

- the TMSI was used;
- the IMSI was used.

If the TMSI has been used, the network may decide to initiate the identification procedure. If the IMSI given by the mobile station then differs from the one the network had associated with the TMSI, the authentication should be restarted with the correct parameters. If the IMSI provided by the MS is the expected one (i.e. authentication has really failed), the network should proceed as described below.

If the IMSI has been used, or the network decides not to try the identification procedure, an AUTHENTICATION REJECT message should be transferred to the mobile station.

After having sent this message, all MM connections in progress (if any) are released and the network should initiate the RR connection release procedure described in section 3.5.of 04.18 (GSM) or in 3GPP TS 25.331 (UMTS).

Upon receipt of an AUTHENTICATION REJECT message, the mobile station shall set the update status in the SIM to U3 ROAMING NOT ALLOWED, delete from the SIM the stored TMSI, LAI and ciphering key sequence number. The SIM shall be considered as invalid until switching off or the SIM is removed.

If the AUTHENTICATION REJECT message is received in the state IMSI DETACH INITIATED the mobile station shall follow section 4.3.4.3.

If the AUTHENTICATION REJECT message is received in any other state the mobile station shall abort any MM specific, MM connection establishment or call re-establishment procedure, stop any of the timers T3210 or T3230 (if running), release all MM connections (if any), start timer T3240 and enter the state WAIT FOR NETWORK COMMAND, expecting the release of the RR connection. If the RR connection is not released within a given time controlled by the timer T3240, the mobile station shall abort the RR connection. In both cases, either after a RR connection release triggered from the network side or after a RR connection abort requested by the MS-side, the MS enters state MM IDLE, substate NO IMSI. If the MS has a separate ongoing RR connection to a different core network node, it shall consider this separate connection as still being good.

#### 4.4.4.7 Location updating not accepted by the network

If the location updating cannot be accepted the network sends a LOCATION UPDATING REJECT message to the mobile station. The mobile station receiving a LOCATION UPDATING REJECT message shall stop the timer T3210, store the reject cause, delete the list of "equivalent PLMNs", start T3240, enter state LOCATION UPDATING REJECTED await the release of the RR connection triggered by the network. Upon the release of the RR connection the mobile station shall take the following actions depending on the stored reject cause:

# 2: IMSI unknown in HLR;

# 3: Illegal MS; or

# 6: Illegal ME.

The mobile station shall set the update status to ROAMING NOT ALLOWED (and store it in the SIM according to section 4.1.2.2), and delete any TMSI, stored LAI and ciphering key sequence number and shall consider the SIM as invalid for non-GPRS services until switch-off or the SIM is removed.

# 11: PLMN not allowed;

# 12: Location Area not allowed; or

# 13: Roaming not allowed in this location area.

The mobile station shall delete any LAI, TMSI and ciphering key sequence number stored in the SIM, reset the attempt counter, set the update status to ROAMING NOT ALLOWED (and store it in the SIM according to section 4.1.2.2). The mobile station shall store the LAI or the PLMN identity in the suitable forbidden list, i.e. in the "forbidden PLMN list" for cause #11, in the list of "forbidden location areas for regional provision of service" for cause #12, and in the list of "forbidden location areas for roaming" for cause #13. In addition, the MS will memorize if cause #13 was received, so to perform a PLMN selection instead of a cell selection when back to the MM IDLE state.

Other values are considered as abnormal cases and the specification of the mobile station behaviour in those cases is given in section 4.4.4.9.

## 4.5.1 MM connection establishment

### 4.5.1.1 MM connection establishment initiated by the mobile station

Upon request of a CM entity to establish an MM connection the MM sublayer first decides whether to accept, delay, or reject this request:

- An MM connection establishment may only be initiated by the mobile station when the following conditions are fulfilled:
  - Its update status is UPDATED.
  - The MM sublayer is in one of the states MM IDLE or MM connection active but not in MM connection active (Group call).

An exception from this general rule exists for emergency calls (see section 4.5.1.5). A further exception is defined in the following clause.

- If an MM specific procedure is running at the time the request from the CM sublayer is received, and the LOCATION UPDATING REQUEST message has been sent, the request will either be rejected or delayed, depending on implementation, until the MM specific procedure is finished and, provided that the network has not sent a "follow-on proceed" indication, the RR connection is released. If the LOCATION UPDATING REQUEST message has not been sent, the mobile station may include a "follow-on request" indicator in the message. The mobile station shall then delay the request until the MM specific procedure is completed, when it may be given the opportunity by the network to use the RR connection: see section 4.4.4.6.

In order to establish an MM connection, the mobile station proceeds as follows:

- a) If no RR connection exists, the MM sublayer requests the RR sublayer to establish an RR connection and enters MM sublayer state WAIT FOR RR CONNECTION (MM CONNECTION). This request contains an establishment cause and a CM SERVICE REQUEST message. When the establishment of an RR connection is indicated by the RR sublayer, the MM sublayer of the mobile station starts timer T3230, gives an indication to the CM entity that requested the MM connection establishment, and enters MM sublayer state WAIT FOR OUTGOING MM CONNECTION.
- b) If an RR connection is available, the MM sublayer of the mobile station sends a CM SERVICE REQUEST message to the network, starts timer T3230, gives an indication to the CM entity that requested the MM connection establishment, and enters:
  - MM sublayer state WAIT FOR OUTGOING MM CONNECTION, if no MM connection is active;
  - MM sublayer state WAIT FOR ADDITIONAL OUTGOING MM CONNECTION, if at least one MM connection is active;
  - If an RR connection exists but the mobile station is in the state WAIT FOR NETWORK COMMAND then any requests from the CM layer that are received will either be rejected or delayed until this state is left.
- c) Only applicable for mobile stations supporting VGCS talking:

If a mobile station which is in the MM sublayer state MM IDLE, service state RECEIVING GROUP CALL (NORMAL SERVICE), receives a request from the GCC sublayer to perform an uplink access, the MM sublayer requests the RR sublayer to perform an uplink access procedure and enters MM sublayer state WAIT FOR RR CONNECTION (GROUP TRANSMIT MODE).

When a successful uplink access is indicated by the RR sublayer, the MM sublayer of the mobile station gives an indication to the GCC sublayer and enters MM sublayer state MM CONNECTION ACTIVE (GROUP TRANSMIT MODE).

When an uplink access reject is indicated by the RR sublayer, the MM sublayer of the mobile station gives an indication to the GCC sublayer and enters the MM sublayer state MM IDLE, service state RECEIVING GROUP CALL (NORMAL SERVICE).

In the network, if an uplink access procedure is performed, the RR sublayer in the network provides an indication to the MM sublayer together with the mobile subscriber identity received in the TALKER

INDICATION message. The network shall then enter the MM sublayer state MM CONNECTION ACTIVE (GROUP TRANSMIT MODE).

The CM SERVICE REQUEST message contains the

- mobile identity according to section 10.5.1.4;
- mobile station classmark 2;
- ciphering key sequence number; and
- CM service type identifying the requested type of transaction (e.g. mobile originating call establishment, emergency call establishment, short message service, supplementary service activation, location services)

A MS supporting eMLPP may optionally include a priority level in the CM SERVICE REQUEST message.

A collision may occur when a CM layer message is received by the mobile station in MM sublayer state WAIT FOR OUTGOING MM CONNECTION or in WAIT FOR ADDITIONAL OUTGOING MM CONNECTION. In this case the MM sublayer in the MS shall establish a new MM connection for the incoming CM message as specified in 4.5.1.3.

Upon receiving a CM SERVICE REQUEST message, the network shall analyse its content. The type of semantic analysis may depend on other on going MM connection(s). Depending on the type of request and the current status of the RR connection, the network may start any of the MM common procedures and RR procedures.

In GSM, the network may initiate the classmark interrogation procedure, for example, to obtain further information on the mobile station's encryption capabilities.

The identification procedure (see section 4.3.3) may be invoked for instance if a TMSI provided by the mobile station is not recognized.

The network may invoke the authentication procedure (see section 4.3.2) depending on the CM service type.

In GSM, the network decides also if the ciphering mode setting procedure shall be invoked (see section 3.4.7 in GSM 04.18).

In UMTS, the network decides also if the security mode control procedure shall be invoked (see section 8.1.10 in 3GPP TS 25.331).

NOTE: If the CM\_SERVICE\_REQUEST message contains a priority level the network may use this to perform queuing and pre-emption as defined in 3GPP TS 23.067.

In GSM, an indication from the RR sublayer that the ciphering mode setting procedure is completed, or reception of a CM SERVICE ACCEPT message, shall be treated as a service acceptance indication by the mobile station.

In UMTS, an indication from the RR sublayer that the security mode control procedure is completed, or reception of a CM SERVICE ACCEPT message, shall be treated as a service acceptance indication by the mobile station. The procedures in section 4.1.1.1.1 shall always have precedence over this section.

In UMTS, during a MM connection establishment for all services, except for emergency call (see chapter 4.1.1.1.1), the security mode control procedure with activation of integrity protection shall be invoked by the network unless integrity protection is already started (see chapter 4.1.1.1.1).

The MM connection establishment is completed, timer T3230 shall be stopped, the CM entity that requested the MM connection shall be informed, and MM sublayer state MM CONNECTION ACTIVE is entered. The MM connection is considered to be active.

If the service request cannot be accepted, the network returns a CM SERVICE REJECT message to the mobile station.

The reject cause information element (see 10.5.3.6 and Annex G) indicates the reason for rejection. The following cause values may apply:

- #4 : IMSI unknown in VLR
- #6 : Illegal ME
- #17 : Network failure

#22 : Congestion

#32 : Service option not supported

#33 : Requested service option not subscribed

#34 : Service option temporarily out of order

If no other MM connection is active, the network may start the RR connection release (see section 3.5) when the CM SERVICE REJECT message is sent.

If a CM SERVICE REJECT message is received by the mobile station, timer T3230 shall be stopped, the requesting CM sublayer entity informed. Then the mobile station shall proceed as follows:

- If the cause value is not #4 or #6 the MM sublayer returns to the previous state (the state where the request was received). Other MM connections shall not be affected by the CM SERVICE REJECT message.
- If cause value #4 is received, the mobile station aborts any MM connection, deletes any TMSI, LAI and ciphering key sequence number in the SIM, changes the update status to NOT UPDATED (and stores it in the SIM according to section 4.1.2.2), and enters the MM sublayer state WAIT FOR NETWORK COMMAND. If subsequently the RR connection is released or aborted, this will force the mobile station to initiate a normal location updating). Whether the CM request shall be memorized during the location updating procedure, is a choice of implementation.
- If cause value #6 is received, the mobile station aborts any MM connection, deletes any TMSI, LAI and ciphering key sequence number in the SIM, changes the update status to ROAMING NOT ALLOWED (and stores it in the SIM according to section 4.1.2.2), and enters the MM sublayer state WAIT FOR NETWORK COMMAND. The mobile station shall consider the SIM as invalid for non-GPRS services until switch-off or the SIM is removed.

#### 4.5.1.6.1 Call re-establishment, initiation by the mobile station

NOTE: The network is unable to initiate call re-establishment.

If at least one request to re-establish an MM connection is received from a CM entity as a response to the indication that the MM connection is interrupted (see 4.5.2.3.) the mobile station initiates the call re-establishment procedure. If several CM entities request re-establishment only one re-establishment procedure is initiated. If any CM entity requests re-establishment, then re-establishment of all transactions belonging to all Protocol Discriminators that permit Call Re-establishment shall be attempted.

Upon request of a CM entity to re-establish an MM connection the MM sublayer requests the RR sublayer to establish an RR connection and enters MM sublayer state WAIT FOR REESTABLISH. This request contains an establishment cause and a CM RE-ESTABLISHMENT REQUEST message. When the establishment of an RR connection is indicated by the RR sublayer, the MM sublayer of the mobile station starts timer T3230, gives an indication to all CM entities that are being re-established, and remains in the MM sublayer state WAIT FOR REESTABLISH.

The CM RE-ESTABLISHMENT REQUEST message contains the

- mobile identity according to section 10.5.1.4;
- mobile station classmark 2;
- ciphering key sequence number.

NOTE: Whether or not a CM entity can request re-establishment depends upon the Protocol Discriminator. The specifications for Short Message Service (GSM 04.11), Call Independent Supplementary Services (TS 24.010) and Location Services (TS 24.071) do not currently specify any re-establishment procedures.

Upon receiving a CM RE-ESTABLISHMENT REQUEST message, the network shall analyse its content. Depending on the type of request, the network may start any of the MM common procedures and RR procedures.

The network may initiate the classmark interrogation procedure, for example, to obtain further information on the mobile station's encryption capabilities.

The identification procedure (see section 4.3.3) may be invoked.

The network may invoke the authentication procedure (see section 4.3.2).

In GSM, the network decides if the security mode setting procedure shall be invoked (see GSM 04.18 section 3.4.7).

An indication from the RR sublayer that the security mode setting procedure is completed, or reception of a CM SERVICE ACCEPT message, shall be treated as a service acceptance indication by the mobile station.

In UMTS, the network decides if the security mode control procedure shall be invoked (see section 8.1.10 in 3GPP TS 25.331). An indication from the RR sublayer that the security mode control procedure is completed, or reception of a CM SERVICE ACCEPT message, shall be treated as a service acceptance indication by the mobile station.

The MM connection re-establishment is completed, timer T3230 shall be stopped, all CM entities associated with the re-establishment shall be informed, and MM sublayer state MM CONNECTION ACTIVE is re-entered. All the MM connections are considered to be active.

If the network cannot associate the re-establishment request with any existing call for that mobile station, a CM SERVICE REJECT message is returned with the reject cause:

#38 "call cannot be identified"

If call re-establishment cannot be performed for other reasons, a CM SERVICE REJECT is returned, the appropriate reject cause may be any of the following (see annex G):

# 4 "IMSI unknown in VLR";

# 6 "illegal ME";

#17 "network failure";

#22 "congestion";



- #32 "service option not supported";
- #34 "service option temporarily out of order".

Whatever the reject cause a mobile station receiving a CM SERVICE REJECT as a response to the CM RE-ESTABLISHMENT REQUEST shall stop T3230, release all MM connections and proceed as described in section 4.5.3.1. In addition:

- if cause value #4 is received, the mobile station deletes any TMSI, LAI and ciphering key sequence number in the SIM, changes the update status to NOT UPDATED (and stores it in the SIM according to section 4.1.2.2), and enters the MM sublayer state WAIT FOR NETWORK COMMAND. If subsequently the RR connection is released or aborted, this will force the mobile station to initiate a normal location updating). The CM re-establishment request shall not be memorized during the location updating procedure.
- if cause value #6 is received, the mobile station deletes any TMSI, LAI and ciphering key sequence number in the SIM, changes the update status to ROAMING NOT ALLOWED (and stores it in the SIM according to section 4.1.2.2), and enters the MM sublayer state WAIT FOR NETWORK COMMAND. The MS shall consider the SIM as invalid for non-GPRS services until switch-off or the SIM is removed.

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## G.1 Causes related to MS identification

Cause value = 2 IMSI unknown in HLR

This cause is sent to the MS if the MS is not known (registered) in the HLR. This cause code does not affect operation of the GPRS service, although it may be used by a GMM procedure.

Cause value = 3 Illegal MS

This cause is sent to the MS when the network refuses service to the MS either because an identity of the MS is not acceptable to the network or because the MS does not pass the authentication check, i.e. the SRES received from the MS is different from that generated by the network. When used by an MM procedure, except the authentication procedure, this cause does not affect operation of the GPRS service.

Cause value = 4 IMSI unknown in VLR

This cause is sent to the MS when the given IMSI is not known at the VLR.

Cause value = 5 IMEI not accepted

This cause is sent to the MS if the network does not accept emergency call establishment using an IMEI.

Cause value = 6 Illegal ME

This cause is sent to the MS if the ME used is not acceptable to the network, e.g. blacklisted. When used by an MM procedure, this cause does not affect operation of the GPRS service.