3GPP TSG CN Plenary Meeting #18 **NP-020549**
4th - 6th December 2002. New Orleans, USA.

Source: **TSG CN WG 1**

Title: **CRs to R99 and Rel-4 (with mirror CRs) on Work Items TEI and TEI4 towards23.009, 23.122 and 24.008**

Agenda item: **7.11**

Document for: **APPROVAL**

Introduction:

This document contains **9** CRs, **R99 and Rel-4 with mirror CRs to** Work Item **"TEI" and to "TEI4"**, that have been agreed by **TSG CN WG1**, and are forwarded to TSG CN Plenary meeting #18 for approval.

Spec	CR #	Rev	CAT	Rel	Tdoc Title	Meeting	TDoc #	C_Version
23.009	081	2	F	R99	MSC_A_HO SDL correction	N1-27	N1-022270	3.11.0
23.009	082	2	A	Rel-4	MSC_A_HO SDL correction	N1-27	N1-022271	4.5.0
23.009	083	2	A	Rel-5	MSC_A_HO SDL correction	N1-27	N1-022272	5.2.0
23.122	056		F	R99	Correction of references	N1-26	N1-021945	3.8.0
23.122	057		A	Rel-4	Correction of references	N1-26	N1-021946	4.2.0
23.122	058		A	Rel-5	Correction of references	N1-26	N1-021947	5.1.0
24.008	719	1	F	R99	Correcting errors and making improvements to references	N1-27	N1-022417	3.13.0
24.008	720	1	F	Rel-4	Correcting errors and making improvements to references	N1-27	N1-022418	4.8.0
24.008	721	1	A	Rel-5	Correcting errors and making improvements to references	N1-27	N1-022419	5.5.0

3GPP TSG-CN1 Meeting #26 ***Tdoc N1-021945***
Miami Beach, Florida, USA, 23 – 27 September 2002

CR-Form-v7

CHANGE REQUEST

⌘ **23.122** **CR** **056** ⌘ **rev** **-** ⌘ Current version: **3.8.0** ⌘

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

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

Title:	⌘	Correction of references
Source:	⌘	Rapporteur (Nokia)
Work item code:	⌘	TEI
Date:	⌘	12/09/2002
Category:	⌘	**F**
Release:	⌘	R99

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

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	Some references to pre-R99 GSM specifications still exist in 23.122
Summary of change:	⌘	Old and redundant references have been updated.
Consequences if not approved:	⌘	Contradictory and confusing specifications.

Clauses affected:	⌘				
Other specs affected:	⌘	**Y**	**N**		
			X	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘				

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

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

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

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

1.1 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document.*

[1] Void.~~3GPP TS 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".~~

[2] 3GPP TS 22.001: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Principles of circuit telecommunication services supported by a Public Land Mobile Network (PLMN)".

[3] 3GPP TS 22.002: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects; Circuit Bearer Services (BS) supported by a Public Land Mobile Network (PLMN)".

[4] 3GPP TS 22.003: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects; Circuit Teleservices supported by a Public Land Mobile Network (PLMN)".

[5] 3GPP TS 22.004: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects; General on supplementary services".

[6] Void.~~3GPP TS 02.06: "Digital cellular telecommunications system (Phase 2+); Types of Mobile Stations (MS)".~~

[7] Void.~~3GPP TS 02.07: "Digital cellular telecommunications system (Phase 2+); Mobile Station (MS) features".~~

[8] Void.~~3GPP TS 02.09: "Digital cellular telecommunications system (Phase 2+); Security aspects".~~

[9] 3GPP TS 22.011: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Service accessibility".

[10] 3GPP TS 22.016: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; International Mobile station Equipment Identities (IMEI)".

[11] 3GPP TS 02.17: "Digital cellular telecommunications system (Phase 2+); Subscriber Identity Modules; Functional Characteristics".

[12] 3GPP TS 22.024: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Description of Charge Advice Information (CAI)".

[13] 3GPP TS 22.030: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects; Man-Machine Interface (MMI) of the User Equipment (UE)".

[14] Void.~~3GPP TS 02.40: "Digital cellular telecommunications system (Phase 2+); Procedures for call progress indications".~~

[15] 3GPP TS 22.041: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Operator Determined Barring (ODB)".

[16] 3GPP TS 22.081: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Line identification Supplementary Services; Stage 1".

[17] 3GPP TS 22.082: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Call Forwarding (CF) supplementary services - Stage 1".

[18] 3GPP TS 22.083: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects; Call Waiting (CW) and Call Holding (HOLD); Supplementary Services - Stage 1".

[19] 3GPP TS 22.084: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects; MultiParty (MPTY) Supplementary Services - Stage 1".

[20] 3GPP TS 22.085: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects; Closed User Group (CUG) Supplementary Services - Stage 1".

[21] 3GPP TS 22.086: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Advice of Charge (AoC) Supplementary Services - Stage 1".

[22] 3GPP TS 22.088: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects; Call Barring (CB) Supplementary Services - Stage 1".

[23] 3GPP TS 24.008: "3rd Generation Partnership Project;Universal Mobile Telecommunications System; Mobile Radio Interface Layer 3 specification, Core Network Protocols - Stage 3".

[24] 3GPP TS 05.02: "Digital cellular telecommunications system (Phase 2+); Multiplexing and multiple access on the radio path".

[25] 3GPP TS 05.08: "Digital cellular telecommunications system (Phase 2+); Radio subsystem link control".

[26] 3GPP TS 22.060: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects; General Packet Radio Service (GPRS); Service description, Stage 1".

[27] 3GPP TS 23.060: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; General Packet Radio Service (GPRS); Service description;Stage 2".

[28] 3GPP TS 03.64: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Overall description of the GPRS Radio Interface; Stage 2".

[29] Void.~~3GPP TS 02.56: "Digital cellular telecommunications system (Phase 2+); GSM Cordless Telephony System (CTS); Service Description; Stage 1".~~

[30] Void.~~3GPP TS 03.56: "Digital cellular telecommunications system (Phase 2+); GSM Cordless Telephony System (CTS) Phase 1; CTS Architecture Description; Stage 2".~~

[31] 3GPP TS 25.101: "UE Radio transmission and Reception (FDD)".

[32] 3GPP TS 25.304: "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; UE Procedures in Idle Mode and Procedures for Cell Reselection in Connected Mode ".

[33] 3GPP TS 25.331: "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; RRC Protocol Specification".

[34] 3GPP TS 04.18:"Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 specification, Radio Resource Control Protocol".

[35] 3GPP TS 03.22: "Digital cellular telecommunications system (Phase 2+); Functions related to Mobile Station (MS) in idle mode and group receive mode".

[36] 3GPP TR 21.905: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Vocabulary for 3GPP Specifications".

[37] 3GPP TS 11.11: "Digital cellular telecommunications system (Phase 2+); Specification of the Subscriber Identity Module - Mobile Equipment (SIM - ME) interface".

[38] 3GPP TS 21.111: "3rd Generation Partnership Project; Technical Specification Group Terminals; USIM and IC card requirements".

[39] 3GPP TS 04.60: "3rd Generation Partnership Project;Technical Specification Group GSM/EDGE Radio Access Network;General Packet Radio Service (GPRS);Mobile Station (MS) - Base Station System (BSS) interface;Radio Link Control/ Medium Access Control (RLC/MAC) protocol".

1.2 Definitions and abbreviations

For the purposes of the present document, the abbreviations defined in ~~3GPP TS 01.04 and~~ 3GPP TS 21.905 apply.

(A/Gb mode only): Indicates this clause applies only to GSM system. For multi system case this is determined by the current serving radio access network.

(Iu mode only): Indicates this clause applies only to UMTS system. For multi system case this is determined by the current serving radio access network.

Acceptable Cell: This is a cell that the MS may camp on to make emergency calls. It must satisfy criteria which is defined for A/Gb mode in 3GPP TS 03.22 and for Iu mode in 3GPP TS 25.304.

Access Technology: The access technology associated with a PLMN. The MS uses this information to determine what type of radio carrier to search for when attempting to select a specific PLMN (e.g., GSM, UMTS or GSM COMPACT). A PLMN may support more than one access technology.

Allowable PLMN: In the case of a MS operating in MS operation mode A or B, **t**his is a PLMN which is not in the list of "forbidden PLMNs" in the MS.
In the case of a MS operating in MS operation mode C, this is a PLMN which is not in the list of "forbidden PLMNs" or in the list of "forbidden PLMNs for GPRS service"in the MS

Available PLMN: For A/Gb mode this is a PLMN where the MS has found a cell that satisfies certain conditions specified in 3GPP TS 03.22. For Iu mode this is a PLMN where the MS has found a cell that satisfies certain conditions specified in 3GPP TS 25.304.

Camped on a cell: The MS (ME if there is no SIM) has completed the cell selection/reselection process and has chosen a cell from which it plans to receive all available services. Note that the services may be limited, and that the PLMN may not be aware of the existence of the MS (ME) within the chosen cell.

Current serving cell: This is the cell on which the MS is camped.

CTS MS: An MS capable of CTS services is a CTS MS.

GPRS MS: An MS capable of GPRS services is a GPRS MS.

MS operation mode See 3GPP TS 23.060 ~~GSM 03.60~~[27].

High quality signal: The high quality signal limit is used in the PLMN selection procedure. It is defined in the appropriate AS specification: GSM TS 03.22 for the GSM radio access technology, 3G TS 25.304 for the UMTS radio access technology (FDD or TDD mode).

Home PLMN: This is a PLMN where the MCC and MNC of the PLMN identity match the MCC and MNC of the IMSI. Matching criteria are defined in Annex A.

In A/Gb mode,...: Indicates this clause applies only to GSM System. For multi system case this is determined by the current serving radio access network.

In Iu mode,...: Indicates this clause applies only to UMTS System. For multi system case this is determined by the current serving radio access network.

Localised Service Area (LSA): A localised service area consists of a cell or a number of cells. The cells constituting a LSA may not necessarily provide contiguous coverage.

Location Registration (LR): An MS which is IMSI attached to non-GPRS services only performs location registration by the Location Updating procedure. A GPRS MS which is IMSI attached to GPRS services or to GPRS and non-GPRS services performs location registration by the Routing Area Update procedure only when in a network of network operation mode I. Both procedures are performed independently by the GPRS MS when it is IMSI attached to GPRS and non-GPRS services in a network of network operation mode II or III (see 3GPP TS 23.060).

MS: Mobile Station. The present document makes no distinction between MS and UE.

Network Type: The network type associated with HPLMN or a PLMN on the PLMN selector (see GSM 11.11). The MS uses this information to determine what type of radio carrier to search for when attempting to select a specific PLMN. A PLMN may support more than one network type.

Registered PLMN (RPLMN): This is the PLMN on which certain LR outcomes have occurred (see table 1).

Registration: This is the process of camping on a cell of the PLMN and doing any necessary LRs.

Registration Area: A registration area is an area in which mobile stations may roam without a need to perform location registration. The registration area corresponds to location area (LA) for performing location updating procedure and it corresponds to routing area for performing the routing area update procedure.

The PLMN to which a cell belongs (PLMN identity) is given in the system information transmitted on the BCCH (MCC + MNC part of LAI).

Selected PLMN: This is the PLMN that has been selected according to clause 3.1, either manually or automatically.

SIM: Subscriber Identity Module (see 3GPP TS 02.17 and 3GPP TS 21.111). The present document makes no distinction between SIM and USIM.

SoLSA exclusive access: Cells on which normal camping is allowed only for MS with Localised Service Area (LSA) subscription.

Suitable Cell: This is a cell on which an MS may camp. It must satisfy criteria which is defined for A/Gb mode in 3GPP TS 03.22 and for Iu mode in 3GPP TS 25.304.

Visited PLMN of home country: This is a PLMN, different from the home PLMN, where the MCC part of the PLMN identity is the same as the MCC of the IMSI.

Visited PLMN: This is a PLMN, different from the home PLMN.

3GPP TSG-CN1 Meeting #26 ***Tdoc N1-021946***
Miami Beach, Florida, USA, 23 – 27 September 2002

CR-Form-v7

CHANGE REQUEST

⌘ **23.122** **CR** **057** ⌘ **rev** **-** ⌘ Current version: **4.2.0** ⌘

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

Title:	⌘	Correction of references
Source:	⌘	Rapporteur (Nokia)
Work item code:	⌘	TEI
Date:	⌘	12/09/2002
Category:	⌘	**A**
Release:	⌘	Rel-4

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A *(corresponds to a correction in an earlier release)*
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Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	Some references to pre-R99 GSM specifications still exist in 23.122
Summary of change:	⌘	Old and redundant references have been updated.
Consequences if not approved:	⌘	Contradictory and confusing specifications.

Clauses affected:	⌘				
Other specs affected:	⌘	**Y**	**N**		
			X	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘				

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[1] Void.~~3GPP TS 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".~~

[2] 3GPP TS 22.001: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Principles of circuit telecommunication services supported by a Public Land Mobile Network (PLMN)".

[3] 3GPP TS 22.002: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects; Circuit Bearer Services (BS) supported by a Public Land Mobile Network (PLMN)".

[4] 3GPP TS 22.003: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects; Circuit Teleservices supported by a Public Land Mobile Network (PLMN)".

[5] 3GPP TS 22.004: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects; General on supplementary services".

[6] Void.~~3GPP TS 02.06: "Digital cellular telecommunications system (Phase 2+); Types of Mobile Stations (MS)".~~

[7] Void.~~3GPP TS 02.07: "Digital cellular telecommunications system (Phase 2+); Mobile Station (MS) features".~~

[8] Void.~~3GPP TS 02.09: "Digital cellular telecommunications system (Phase 2+); Security aspects".~~

[9] 3GPP TS 22.011: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Service accessibility".

[10] 3GPP TS 22.016: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; International Mobile station Equipment Identities (IMEI)".

[11] 3GPP TS 42.017: "3rd Generation Partnership Project;Technical Specification Group Terminals;Subscriber Identity Modules (SIM);Functional characteristics".~~3GPP TS 02.17: "Digital cellular telecommunications system (Phase 2+); Subscriber Identity Modules; Functional Characteristics".~~

[12] 3GPP TS 22.024: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Description of Charge Advice Information (CAI)".

[13] 3GPP TS 22.030: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects; Man-Machine Interface (MMI) of the User Equipment (UE)".

[14] Void.~~3GPP TS 02.40: "Digital cellular telecommunications system (Phase 2+); Procedures for call progress indications".~~

[15] 3GPP TS 22.041: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Operator Determined Barring (ODB)".

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[17] 3GPP TS 22.082: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Call Forwarding (CF) supplementary services - Stage 1".

[18] 3GPP TS 22.083: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects; Call Waiting (CW) and Call Holding (HOLD); Supplementary Services - Stage 1".

[19] 3GPP TS 22.084: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects; MultiParty (MPTY) Supplementary Services - Stage 1".

[20] 3GPP TS 22.085: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects; Closed User Group (CUG) Supplementary Services - Stage 1".

[21] 3GPP TS 22.086: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Advice of Charge (AoC) Supplementary Services - Stage 1".

[22] 3GPP TS 22.088: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects; Call Barring (CB) Supplementary Services - Stage 1".

[23] 3GPP TS 24.008: "3rd Generation Partnership Project;Universal Mobile Telecommunications System; Mobile Radio Interface Layer 3 specification, Core Network Protocols - Stage 3".

[24] 3GPP TS 45.002~~05.02~~: "~~Digital cellular telecommunications system (Phase 2+)~~3rd Generation Partnership Project;Technical Specification Group GSM/EDGE;Radio Access Network; Multiplexing and multiple access on the radio path".

[25] 3GPP TS 45.008~~05.08~~: "~~Digital cellular telecommunications system (Phase 2+)~~3rd Generation Partnership Project; Technical Specification Group GSM/EDGE;Radio Access Network; Radio subsystem link control".

[26] 3GPP TS 22.060: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects; General Packet Radio Service (GPRS); Service description, Stage 1".

[27] 3GPP TS 23.060: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; General Packet Radio Service (GPRS); Service description;Stage 2".

[28] 3GPP TS ~~43.064~~03.64: "~~Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS);~~ 3rd Generation Partnership Project;Technical Specification Group GERAN;Digital cellular telecommunications system (Phase 2+);General Packet Radio Service (GPRS); Overall description of the GPRS Radio Interface; Stage 2".

[29] Void.~~3GPP TS 02.56: "Digital cellular telecommunications system (Phase 2+); GSM Cordless Telephony System (CTS); Service Description; Stage 1".~~

[30] Void.~~3GPP TS 03.56: "Digital cellular telecommunications system (Phase 2+); GSM Cordless Telephony System (CTS) Phase 1; CTS Architecture Description; Stage 2".~~

[31] 3GPP TS 25.101: "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; UE Radio transmission and Reception (FDD)".

[32] 3GPP TS 25.304: "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; UE Procedures in Idle Mode and Procedures for Cell Reselection in Connected Mode".

[33] 3GPP TS 25.331: "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; RRC Protocol Specification".

[34] 3GPP TS 44.018~~04.18~~:" 3rd Generation Partnership Project;Technical Specification Group GSM/EDGE Radio Access Network;Mobile radio interface layer 3 specification,Radio Resource Control Protocol ~~Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 specification, Radio Resource Control Protocol~~".

[35] 3GPP TS 43.022~~03.22~~: "3rd Generation Partnership Project;Technical Specification Group GSM/EDGE Radio Access Network;Functions related to Mobile Station (MS) in idle mode and group receive mode~~Digital cellular telecommunications system (Phase 2+); Functions related to Mobile Station (MS) in idle mode and group receive mode~~".

[36] 3GPP TR 21.905: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Vocabulary for 3GPP Specifications".

[37] 3GPP TS 51.011 ~~11.11~~: "~~Digital cellular telecommunications system (Phase 2+); Specification of the Subscriber Identity Module - Mobile Equipment (SIM - ME) interface~~3rd Generation Partnership Project;Technical Specification Group Terminals;Specification of the Subscriber Identity Module -Mobile Equipment (SIM - ME) interface".

[38] 3GPP TS 21.111: "3rd Generation Partnership Project; Technical Specification Group Terminals; USIM and IC card requirements".

[39] 3GPP TS 44.060: "3rd Generation Partnership Project;Technical Specification Group GSM/EDGE Radio Access Network;General Packet Radio Service (GPRS);Mobile Station (MS) - Base Station System (BSS) interface;Radio Link Control/Medium Access Control (RLC/MAC) protocol".

[40] 3GPP TS 31.102: "3rd Generation Partnership Project;Technical Specification Group Terminals;Characteristics of the USIM Application".

1.2 Definitions and abbreviations

For the purposes of the present document, the abbreviations defined in ~~3GPP TS 01.04 and~~ 3GPP TS 21.905 apply.

(A/Gb mode only): Indicates this clause applies only to GSM system. For multi system case this is determined by the current serving radio access network.

(Iu mode only): Indicates this clause applies only to UMTS system. For multi system case this is determined by the current serving radio access network.

Acceptable Cell: This is a cell that the MS may camp on to make emergency calls. It must satisfy criteria which is defined for A/Gb mode in 3GPP TS ~~03.22~~43.022 and for Iu mode in 3GPP TS 25.304.

Access Technology: The access technology associated with a PLMN. The MS uses this information to determine what type of radio carrier to search for when attempting to select a specific PLMN (e.g., GSM, UMTS or GSM COMPACT). A PLMN may support more than one access technology.

Allowable PLMN: In the case of a MS operating in MS operation mode A or B, **t**his is a PLMN which is not in the list of "forbidden PLMNs" in the MS. In the case of a MS operating in MS operation mode C, this is a PLMN which is not in the list of "forbidden PLMNs" or in the list of "forbidden PLMNs for GPRS service" in the MS

Available PLMN: For A/Gb mode this is a PLMN where the MS has found a cell that satisfies certain conditions specified in 3GPP TS ~~03.22~~43.022. For Iu mode this is a PLMN where the MS has found a cell that satisfies certain conditions specified in 3GPP TS 25.304.

Camped on a cell: The MS (ME if there is no SIM) has completed the cell selection/reselection process and has chosen a cell from which it plans to receive all available services. Note that the services may be limited, and that the PLMN may not be aware of the existence of the MS (ME) within the chosen cell.

Current serving cell: This is the cell on which the MS is camped.

CTS MS: An MS capable of CTS services is a CTS MS.

GPRS MS: An MS capable of GPRS services is a GPRS MS.

MS operation mode: See GSM 23.060~~03.60~~[27].

High quality signal: The high quality signal limit is used in the PLMN selection procedure. It is defined in the appropriate AS specification: GSM TS ~~03.22~~43.022 for the GSM radio access technology, 3GPP TS 25.304 for the UMTS radio access technology (FDD or TDD mode).

Home PLMN: This is a PLMN where the MCC and MNC of the PLMN identity match the MCC and MNC of the IMSI. Matching criteria are defined in Annex A.

In A/Gb mode,...: Indicates this clause applies only to GSM System. For multi system case this is determined by the current serving radio access network.

In Iu mode,...: Indicates this clause applies only to UMTS System. For multi system case this is determined by the current serving radio access network.

Localised Service Area (LSA): A localised service area consists of a cell or a number of cells. The cells constituting a LSA may not necessarily provide contiguous coverage.

Location Registration (LR): An MS which is IMSI attached to non-GPRS services only performs location registration by the Location Updating procedure. A GPRS MS which is IMSI attached to GPRS services or to GPRS and non-GPRS services performs location registration by the Routing Area Update procedure only when in a network of network operation mode I. Both procedures are performed independently by the GPRS MS when it is IMSI attached to GPRS and non-GPRS services in a network of network operation mode II or III (see 3GPP TS 23.060).

MS: Mobile Station. The present document makes no distinction between MS and UE.

Network Type: The network type associated with HPLMN or a PLMN on the PLMN selector (see ~~GSM 11.11~~3GPP TS 51.011 and 3GPP 31.102). The MS uses this information to determine what type of radio carrier to search for when attempting to select a specific PLMN. A PLMN may support more than one network type.

Registered PLMN (RPLMN): This is the PLMN on which certain LR outcomes have occurred (see table 1).

Registration: This is the process of camping on a cell of the PLMN and doing any necessary LRs.

Registration Area: A registration area is an area in which mobile stations may roam without a need to perform location registration. The registration area corresponds to location area (LA) for performing location updating procedure and it corresponds to routing area for performing the routing area update procedure.

The PLMN to which a cell belongs (PLMN identity) is given in the system information transmitted on the BCCH (MCC + MNC part of LAI).

Selected PLMN: This is the PLMN that has been selected according to clause 3.1, either manually or automatically.

SIM: Subscriber Identity Module (see 3GPP TS 21.111 and 3GPP TS 42.017~~02.17~~). The present document makes no distinction between SIM and USIM.

SoLSA exclusive access: Cells on which normal camping is allowed only for MS with Localised Service Area (LSA) subscription.

Suitable Cell: This is a cell on which an MS may camp. It must satisfy criteria which is defined for A/Gb mode in 3GPP TS ~~03.22~~43.022 and for Iu mode in 3GPP TS 25.304.

Visited PLMN of home country: This is a PLMN, different from the home PLMN, where the MCC part of the PLMN identity is the same as the MCC of the IMSI.

Visited PLMN: This is a PLMN, different from the home PLMN.

2 General description of idle mode

When an MS is switched on, it attempts to make contact with a public land mobile network (PLMN). The particular PLMN to be contacted may be selected either automatically or manually.

The MS looks for a suitable cell of the chosen PLMN and chooses that cell to provide available services, and tunes to its control channel. This choosing is known as "camping on the cell". The MS will then register its presence in the registration area of the chosen cell if necessary, by means of a location registration (LR), GPRS attach or IMSI attach procedure.

If the MS loses coverage of a cell, or find a more suitable cell, it reselects onto the most suitable cell of the selected PLMN and camps on that cell. If the new cell is in a different registration area, an LR request is performed.

If the MS loses coverage of a PLMN, either a new PLMN is selected automatically, or an indication of which PLMNs are available is given to the user, so that a manual selection can be made.

Registration is not performed by MSs only capable of services that need no registration.

The purpose of camping on a cell in idle mode is fourfold:

a) It enables the MS to receive system information from the PLMN.

b) If the MS wishes to initiate a call, it can do this by initially accessing the network on the control channel of the cell on which it is camped (with the exceptions defined in 3GPP TS ~~03.22~~43.022 clauses 3.5.3 and 3.5.4 and 3GPP TS 25.304).

c) If the PLMN receives a call for the MS, it knows (in most cases) the registration area of the cell in which the MS is camped. It can then send a "paging" message for the MS on control channels of all the cells in the registration area. The MS will then receive the paging message because it is tuned to the control channel of a cell in that registration area, and the MS can respond on that control channel.

d) It enables the MS to receive cell broadcast messages.

If the MS is unable to find a suitable cell to camp on, or the SIM is not inserted, or if it receives certain responses to an LR request (e.g., "illegal MS"), it attempts to camp on a cell irrespective of the PLMN identity, and enters a "limited service" state in which it can only attempt to make emergency calls.

In A/Gb mode, if the CTS MS is in CTS mode only or in automatic mode with CTS preferred, it will start by attempting to find a CTS fixed part on which it is enrolled

The idle mode tasks can be subdivided into 4 processes:

- PLMN selection;
- Cell selection and reselection;
- Location registration;
- CTS fixed part selection (A/Gb mode only).

In A/Gb mode, to make this initial CTS fixed part selection, the MS shall be enrolled on at least one fixed part.

The relationship between these processes is illustrated in figure 1 in clause 5. The states and state transitions within each process are shown in figures 2 to 4 in clause 5.

3 Requirements and technical solutions

The following clauses 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 PLMNs" 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 PLMNs" 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".

3.2 Regional provision of service

An MS may have a "regionally restricted service" where it can only obtain service on certain LAs. If such an MS attempts to camp on a cell of an LA for which it does not have service entitlement, when it does an LR request, it will receive an "LA not allowed" message. In this case:

- The MS stores the forbidden LA identity (LAI) in a list of "forbidden LAs for regional provision of service", to prevent repeated access attempts on a cell of the forbidden LA. This list is deleted when the MS is switched off or the SIM is removed. The MS enters the limited service state.

In A/Gb mode, a cell may be reserved for SoLSA exclusive access (see 3GPP TS 24.008 and ~~04.60~~3GPP TS 44.060). An MS is only allowed to camp normally on such a cell if it has a Localised Service Area subscription to the cell. Other MS may enter the limited service state.

NOTE: In A/Gb mode, in a SoLSA exclusive cell the MCC+MNC code is replaced by an unique escape PLMN code (see 3GPP TS 23.073), not assigned to any PLMN, in SI3 and SI4. An MS not supporting SoLSA may request for location update to an exclusive access cell. In this case the location attempt is rejected with the cause "PLMN not allowed" and the escape PLMN code is added to the list of the "forbidden PLMNs".

3.3 Borders between registration areas

If the MS is moving in a border area between registration areas, it might repeatedly change between cells of different registration areas. Each change of registration area would require an LR, which would cause a heavy signalling load and increase the risk of a paging message being lost. The access stratum shall provide a mechanism to limit this effect.

3.4 Access control

3.4.1 Access control

Due to problems in certain areas, Network Operators may decide to restrict access from some MSs (e.g., in case of congestion), and for this reason an access control mechanism shall be provided.

3.4.2 Forbidden LA for regional provision of service

When the MS is camped on a cell, the LA of which belongs to the list of "forbidden LAs for regional provision of service", the MS is not allowed to initiate establishment of a CM connection except for an emergency call; it may respond to paging. Also, the MS is not allowed to request GPRS services when camped on a cell of a LA of which belongs to the list of "forbidden LAs for regional provision of service".

3.5 No suitable cell (limited service state)

There are a number of situations in which the MS is unable to obtain normal service from a PLMN. These include:

a) Failure to find a suitable cell of the selected PLMN;

b) No SIM in the MS;

c) A "PLMN not allowed" response to an LR;

d) An "illegal MS", "illegal ME" or "IMSI unknown in HLR" response to an LR; (Any SIM in the ME is then considered "invalid".)

e) A "GPRS not allowed" response to an LR of a GPRS MS attached to GPRS services only. (The cell selection state of GPRS MSs attached to GPRS and non-GPRS depends on the outcome of the location updating.)

(In automatic PLMN selection mode, events (a), (c) and (e) would normally cause a new PLMN selection, but even here, the situation may arise when no PLMNs are available and allowable for use).

Under any of these conditions, the MS attempts to camp on an acceptable cell, irrespective of its PLMN identity, so that emergency calls can be made if necessary. When in the limited service state with a valid SIM, the MS shall search for available and allowable PLMNs in the manner described in clause 4.4.3.1 and when indicated in the SIM also as described in clause 4.4.3.4. No LR requests are made until a valid SIM is present and either a suitable cell is found or a manual network reselection is performed. In the limited service state the presence of the MS need not be known to the PLMN on whose cell it has camped.

There are also other conditions under which only emergency calls may be made. These are shown in table 2 in clause 5.

3.6 CTS fixed part selection (A/Gb mode only)

In CTS mode only or in automatic mode with CTS preferred, the CTS MS normally operates on a CTS fixed part on which the mobile station is already enrolled. If the CTS MS loses CTS coverage in these modes, it shall attempt periodically to select again a CTS fixed part.

To select a CTS fixed part, the CTS MS shall listen to the CTSBCH frequencies of all the fixed parts on which the MS is currently enrolled.

If the CTS MS is moving in a border area between one area with CTS coverage and one without it, it might repeatedly require CTS attachments and LU on the PLMN. To prevent this, the criteria C1_CTS and C2_CTS (defined in 3GPP TS 45.008~~05.08~~ clause 11.1) are used. To attach to a CTS FP, the C1_CTS criterion shall be greater than zero. When the C2_CTS criterion falls below zero, the CTS MS shall consider itself to be no more under CTS coverage.

4 Overall process structure

4.1 Process goal

The aim of the idle mode processes is to ensure that the registered PLMN is the selected PLMN.

4.2 States description

Each of the processes of PLMN selection, cell selection and location registration can be described by a set of states. The overall state of the mobile is thus a composite of the states of the three processes. In some cases, an event which causes a change of state in one process may trigger a change of state in another process, e.g., camping on a cell in a new registration area triggers an LR request. The relationship between the processes is illustrated in figure 1 in clause 5.

The states in which the MS may be, for each of the processes, are described below and illustrated in figures 2 to 4 in clause 5. For many of the states, a fuller description can be found in other Technical Specifications, and a reference to the Technical Specification is given after the state description.

In the event of any conflict between the diagrams and the text in the present document, the text takes precedence.

4.3 List of states

4.3.1 List of states for the PLMN selection process

4.3.1.1 List of states for automatic mode (figure 2a)

A1 Trying RPLMN - The MS is trying to perform a Location Registration on the registered PLMN.

A2 On PLMN - The MS has successfully registered on a PLMN.

A3 Trying PLMN - The MS is trying to register on a PLMN in the ordered list of PLMNs.

A4 Wait for PLMNs to appear - There are no allowable and available PLMNs at present and the MS is waiting for one to appear.

A5 HPLMN search in progress - The MS is trying to find if the HPLMN is available.

A6 No SIM - There is no SIM in the MS, or certain LR responses have been received.

4.3.1.2 List of states for manual mode (figure 2b)

M1 Trying registered PLMN - The MS is trying to perform a Location Registration on the registered PLMN.

M2 On PLMN - The MS has successfully registered on a PLMN.

M3 Not on PLMN - The MS has failed to register on the selected PLMN.

M4 Trying PLMN - The MS is trying to register on a user selected PLMN.

M5 No SIM - There is no SIM in the MS, or certain LR responses have been received.

4.3.2 List of states for location updating (figure 3)

The states are entered depending on responses to location update (LU) requests.

4.3.3 List of states for location registration (figure 3)

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 clause 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 clause 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]

4.4 PLMN selection process

4.4.1 Introduction

There are two modes for PLMN selection, automatic and manual. These are described in clauses 4.4.3 below and illustrated in figures 2a to 2b in clause 5.

4.4.2 Registration on a PLMN

The MS shall perform registration on the PLMN if the MS is capable of services which require registration. In both automatic and manual modes, the concept of registration on a PLMN is used. An MS successfully registers on a PLMN if:

a) The MS has found a suitable cell of the PLMN to camp on; and

b) An LR request from the MS has been accepted in the registration area of the cell on which the MS is camped (see table 1).

4.4.3 PLMN selection

The registration on the selected PLMN and the location registration are only necessary if the MS is capable of services which require registration. Otherwise, the PLMN selection procedures are performed without registration.

The "HPLMN Selector with Access Technology", "User Controlled PLMN Selector with Access Technology" and "Operator Controlled PLMN Selector with Access Technology" data fields in the SIM include associated access technologies for each PLMN entry, see 3GPP TS 51.011 and 3GPP TS 31.102~~GSM 11.11 [37]~~. The PLMN/access technology combinations are listed in priority order. If an entry includes more than one access technology, then no priority is defined for the preferred access technology and the priority is an implementation issue.

The Mobile Equipment stores a list of "equivalent PLMNs". This list is replaced or deleted at the end of each location update procedure, routing area update procedure and GPRS attach procedure. The stored list consists of a list of equivalent PLMNs as downloaded by the network plus the PLMN code of the network that downloaded the list. All PLMNs in the stored list are regarded as equivalent to each other for PLMN selection, cell selection/re-selection and handover.

The MS shall not use the PLMN codes contained in the "HPLMN Selector with Access Technology" data field.

NOTE 1: To allow provision for multiple HPLMN codes, the HPLMN access technologies are stored on the SIM together with PLMN codes. This version of the specification does not support multiple HLPMN codes and the "HPLMN Selector with Access Technology" data field is only used by the MS to get the HPLMN access technologies. The HPLMN code is the PLMN code included in the IMSI.

NOTE 2: Different GSM frequency bands (eg. 900, 1800, 1900, 400) are all considered GSM access technology. An MS supporting more than one band should scan all the bands it's supports when scanning for GSM frequencies. However GSM COMPACT systems which use GSM frequency bands but with the CBPCCH broadcast channel are considered as a separate access technology from GSM.

4.4.3.1 At switch-on or recovery from lack of coverage

At switch on, or following recovery from lack of coverage,the MS selects the registered PLMN or equivalent PLMN (if it is available) using all access technologies that the MS is capable of and if necessary (in the case of recovery from lack of coverage, see clause 4.5.2) attempts to perform a Location Registration.

EXCEPTION: In A/Gb mode or GSM COMPACT, an MS with voice capability, shall not search for CPBCCH carriers, unless the "RPLMN Last Used Access Technology" field is available in the SIM and indicates GSM COMPACT. In A/Gb mode or GSM COMPACT, an MS not supporting packet services shall not search for CPBCCH carriers.

If successful registration is achieved, the MS indicates the selected PLMN.

If there is no registered PLMN, or if registration is not possible due to the PLMN being unavailable or registration failure, the MS follows one of the following two procedures depending on its operating mode.

EXCEPTION: If registration is not possible on recovery from lack of coverage due to the registered PLMN being unavailable, a MS attached to GPRS services may, optionally, continue looking for the registered PLMN for an implementation dependent time.

NOTE: A MS attached to GPRS services should use the above exception only if one or more PDP contexts are currently active.

4.4.3.1.1 Automatic Network Selection Mode Procedure

The MS selects and attempts registration on other PLMNs, if available and allowable, in the following order:

i) HPLMN (if not previously selected);

ii) each PLMN in the "User Controlled PLMN Selector with Access Technology" data field in the SIM (in priority order);

iii) each PLMN in the "Operator Controlled PLMN Selector with Access Technology" data field in the SIM (in priority order);

iv) other PLMN/access technology combinations with received high quality signal in random order;

v) other PLMN/access technology combinations in order of decreasing signal quality.

When following the above procedure the following requirements apply:

a) An MS with voice capability shall ignore PLMNs for which the MS has identified at least one GSM COMPACT.

b) In A/Gb mode or GSM COMPACT, an MS with voice capability, or an MS not supporting packet services shall not search for CPBCCH carriers.

c) In ii and iii, the MS should limit its search for the PLMN to the access technology or access technologies associated with the PLMN in the appropriate PLMN Selector with Access Technology list (User Controlled or Operator Controlled selector list). An MS using a SIM without access technology information storage (i.e. the "User Controlled PLMN Selector with Access Technology" and the "Operator Controlled PLMN Selector with Access Technology" data fields are not present) shall instead use the "PLMN Selector" data field, for each PLMN in the "PLMN Selector" data field, the MS shall search for all access technologies it is capable of and shall assume GSM access technology as the highest priority radio access technology.

d) In iv and v, the MS shall search for all access technologies it is capable of, before deciding which PLMN to select.

e) In ii, and iii, a packet only MS which supports GSM COMPACT, but using a SIM without access technology information storage (i.e. the "User Controlled PLMN Selector with Access Technology" and the "Operator Controlled PLMN Selector with Access Technology" data fields are not present) shall instead use the "PLMN Selector" data field, for each PLMN in the "PLMN Selector" data field, the MS shall search for all access technologies it is capable of and shall assume GSM COMPACT access technology as the lowest priority radio access technology.

f) In i, the MS shall search for all access technologies it is capable of. The MS shall start its search using the access technologies stored in the "HPLMN Selector with Access Technology" data field on the SIM in priority order as defined in clause 4.4.3 (i.e. the PLMN/access technology combinations are listed in priority order, if an entry includes more than one access technology then no priority is defined for the preferred access technology and the priority is an implementation issue).

g) In i, an MS using a SIM without access technology information storage (i.e. the "HPLMN Selector with Access Technology" data field is not present) shall search for all access technologies it is capable of and shall assume GSM access technology as the highest priority radio access technology. A packet only MS which supports GSM COMPACT using a SIM without access technology information storage shall also assume GSM COMPACT access technology as the lowest priority radio access technology.

h) In v, the MS shall order the PLMN/access technology combinations in order of decreasing signal quality within each access technology. The order between PLMN/access technology combinations with different access technologies is an MS implementation issue.

NOTE 1: Requirements a) and b) apply also to requirement d), so a GSM voice capable MS should not search for GSM COMPACT PLMNs, even if capable of GSM COMPACT.

NOTE 2: Requirements a) and b) apply also to requirement f), so a GSM voice capable MS should not search for GSM COMPACT PLMNs, even if this is the only access technology on the "HPLMN Selector with Access Technology" data field on the SIM.

NOTE 3: High quality signal is defined in the appropriate AS specification.

If successful registration is achieved, the MS indicates the selected PLMN.

If registration cannot be achieved because no PLMNs are available and allowable, the MS indicates "no service" to the user, waits until a new PLMN is available and allowable and then repeats the procedure.

If there were one or more PLMNs which were available and allowable, but an LR failure made registration on those PLMNs unsuccessful or an entry in the "forbidden LAs for regional provision of service" list prevented a registration attempt, the MS selects the first such PLMN again and enters a limited service state.

4.4.3.1.2 Manual Network Selection Mode Procedure

The MS indicates whether there are any PLMNs, which are available using all supported access technologies. This includes PLMNs in the "forbidden PLMNs" list and PLMNs which only offer services not supported by the MS. An MS which supports GSM COMPACT shall also indicate GSM COMPACT PLMNs (which use PBCCH).

If displayed, PLMNs meeting the criteria above are presented in the following order:

i)- HPLMN;

ii)- PLMNs contained in the " User Controlled PLMN Selector with Access Technology " data field in the SIM (in priority order);

iii)- PLMNs contained in the "Operator Controlled PLMN Selector with Access Technology" data field in the SIM (in priority order);

iv)- other PLMN/access technology combinations with received high quality signal in random order;

v)- other PLMN/access technology combinations in order of decreasing signal quality.

In ii and iii, an MS using a SIM without access technology information storage (i.e. the "User Controlled PLMN Selector with Access Technology" and the "Operator Controlled PLMN Selector with Access Technology" data fields are not present) shall instead present the PLMNs contained in the "PLMN Selector" data field in the SIM (in priority order).

In v, requirement h) in clause 4.4.3.1.1 applies.

In GSM COMPACT, the non support of voice services shall be indicated to the user.

The user may select his desired PLMN and the MS then initiates registration on this PLMN using the access technology chosen by the user for that PLMN or using the highest priority available access technology for that PLMN, if the associated access technologies have a priority order. (This may take place at any time during the presentation of PLMNs). For such a registration, the MS shall ignore the contents of the "forbidden LAs for roaming", "forbidden LAs for regional provision of service", "forbidden PLMNs for GPRS service" and "forbidden PLMNs" lists.

NOTE 1: It is an MS implementation option whether to indicate access technologies to the user. If the MS does display access technologies, then the access technology used should be the access technology chosen by the user for that PLMN. If the MS does not display access technologies, then the access technology chosen for a particular PLMN should be the highest priority available access technology for that PLMN, if the associated access technologies have a priority order.

If the user does not select a PLMN, the selected PLMN shall be the one that was selected before the PLMN selection procedure started. If no such PLMN was selected or that PLMN is no longer available, then the MS shall attempt to camp on any acceptable cell and enter the limited service state.

NOTE 2: High quality signal is defined in the appropriate AS specification.

4.4.3.2 User reselection

At any time the user may request the MS to initiate reselection and registration onto an available PLMN, according to the following procedures, dependent upon the operating mode.

4.4.3.2.1 Automatic Network Selection Mode

The MS selects and attempts registration on PLMNs, if available and allowable, in all of its bands of operation in accordance with the following order:

i) HPLMN;

ii) PLMNs contained in the " User Controlled PLMN Selector with Access Technology" data field in the SIM (in priority order) excluding the previously selected PLMN;

iii) PLMNs contained in the "Operator Controlled PLMN Selector with Access Technology" data field in the SIM (in priority order) excluding the previously selected PLMN;

iv) other PLMN/access technology combinations with the received high quality signal in random order excluding the previously selected PLMN;

v) other PLMN/access technology combinations, excluding the previously selected PLMN in order of decreasing signal quality or, alternatively, the previously selected PLMN may be chosen ignoring its signal quality;

vi) The previously selected PLMN.

The previously selected PLMN is the PLMN which the MS has selected prior to the start of the user reselection procedure.

NOTE 1: If the previously selected PLMN is chosen, and registration has not been attempted on any other PLMNs, then the MS is already registered on the PLMN, and so registration is not necessary.

When following the above procedure the requirements a), b), c), e), f), g), h) in clause 4.4.3.1.1 apply: Requirement d) shall apply as shown below:

d) In iv, v, and vi, the MS shall search for all access technologies it is capable of before deciding which PLMN to select.

NOTE 2: High quality signal is defined in the appropriate AS specification.

4.4.3.2.2 Manual Network Selection Mode

The Manual Network Selection Mode Procedure of clause 4.4.3.1.2 is followed.

4.4.3.3 In VPLMN

If the MS is in a VPLMN, the MS shall periodically attempt to obtain service on its HPLMN or higher priority PLMN listed in "user controlled PLMN selector" or "operator controlled PLMN selector" by scanning in accordance with the requirements that are applicable to i), ii) and iii) as defined in the Automatic Network Selection Mode in clause 4.4.3.1.1. In the case that the mobile has a stored "Equivalent PLMNs" list the mobile shall only select a PLMN if it is of a higher priority than those of the same country as the current serving PLMN which are stored in the "Equivalent PLMNs" list. For this purpose, a value T minutes may be stored in the SIM, T is either in the range 6 minutes to 8 hours in 6 minute steps or it indicates that no periodic attempts shall be made. If no value is stored in the SIM, a default value of 60 minutes is used.

The attempts to access the HPLMN or higher priority PLMN shall be as specified below:

a) The periodic attempts shall only be performed in automatic mode when the MS is roaming;

b) After switch on, a period of at least 2 minutes and at most T minutes shall elapse before the first attempt is made;

c) The MS shall make an attempt if the MS is on the VPLMN at time T after the last attempt;

d) Periodic attempts shall only be performed by the MS while in idle mode;

e) If the HPLMN or higher priority PLMN is not found, the MS shall remain on the VPLMN.

f) In steps i), ii) and iii) the MS shall limit its attempts to access higher priority PLMNs to PLMNs of the same country as the current serving VPLMN.

g) Only the priority levels of Equivalent PLMNs of the same country as the current serving VPLMN shall be taken into account to compare with the priority level of a selected PLMN.

4.4.3.4 Investigation Scan for higher prioritized PLMN

The support of this procedure is mandatory if the ME supports GSM COMPACT and otherwise optional.

A MS capable of both GSM voice and packet service shall, when indicated in the SIM, investigate if there is service from a higher prioritized PLMN not offering GSM voice service, either HPLMN or a PLMN in a "PLMN Selector with Access Technology " data field on the SIM.

The MS shall scan for PLMNs in accordance with the requirements described for automatic network selection mode in clause 4.4.3.1.1 that are applicable to i), ii) and iii) with the exception of requirement a) and b) in clause 4.4.3.1. Requirement a) and b) that are specified for automatic network selection mode in clause 4.4.3.1 shall be ignored during the investigation scan.

If indicated on the SIM, the investigation scan shall be performed:

i) After each successful PLMN selection and registration is completed, when the MS is in idle mode. This investigation scan may rely on the information from the already performed PLMN selection and may not necessarily require a rescan

ii) When the MS is unable to obtain normal service from a PLMN, (limited service state) see clause 3.5.

The investigation scan is restricted to automatic selection mode and shall only be performed by an MS that is capable of both voice and packet data. It shall only be performed if the selected PLMN is not already the highest prioritized PLMN in the current country. (HPLMN in home country, otherwise according to PLMN selector lists)

The MS shall return to RPLMN after the investigation scan is performed.

If a higher prioritized PLMN not offering GSM voice service is found, this shall be indicated to the user. The MS shall not select the PLMN unless requested by the user.

4.4.4 Abnormal cases

If there is no SIM in the MS, if there is an authentication failure, or if the MS receives an "IMSI unknown in HLR", "illegal ME" or "illegal MS" response to an LR request, then effectively there is no selected PLMN ("No SIM" state). In these cases, the states of the cell selection process are such that no PLMN selection information is used. No further attempts at registration on any PLMN are made until the MS is switched off and on again, or a SIM is inserted.

When in Automatic Network Selection mode and the MS is in the "not updated" state with one or more suitable cells to camp on; then after the maximum allowed unsuccessful LR requests (controlled by the specific attempt counters) the MS may continue (or start if it is not running) the user reselection procedure of 4.4.3.2 1.

4.4.5 Roaming not allowed in this LA

If in either PLMN selection mode the LR response "Roaming not allowed in this LA" is received:

The PLMN Automatic or Manual Mode Selection Procedure of clause 4.4.3.1 are followed, depending on whether the MS is in automatic or manual mode.

4.5 Location registration process

4.5.1 General

When the MS is switched on and capable of services requiring registration, the action taken by the location registration process is as follows:

a) SIM present and no LR needed (because of the status of the stored registration area identity and "attach" flag): The MS is in the update state UPDATED;

b) SIM present and LR needed: A LR request is made;

c) No SIM present: The MS enters the update state Idle, NO IMSI.

In case b) above, and subsequently whenever a LR request is made, the MS enters a state depending on the outcome of the LR request, as listed in clause 4.3.2 above. In case c) the GPRS and the non-GPRS update state enters "IDLE, NO IMSI".

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

4.5.2 Initiation of Location Registration

An LR request indicating Normal Updating is made when, in idle mode,

- the MS changes cell while being in the update state NOT UPDATED; (for MS capable of GPRS and non-GPRS services when at least one of both update states is NOT UPDATED)
- the MS detects that it has entered a new registration area, i.e., when the received registration area identity differs from the one stored in the MS, and the LAI or the PLMN identity is not contained in any of the lists of "forbidden LAs for roaming", "forbidden LAs for regional provision of service", "forbidden PLMNs for GPRS service" or "forbidden PLMNs" respectively, while being in one of the following update states:
  - UPDATED;
  - NOT UPDATED;
  - ROAMING NOT ALLOWED.
- the Periodic Location Updating Timer expires while being in the non-GPRS update state NOT UPDATED (triggers Location Updating);
- the Periodic Routing Area Update timer expires while being in the GPRS update state NOT UPDATED (triggers Routing Area Update);
- a manual network reselection has been performed, an acceptable cell of the selected PLMN is present, and the MS is not in the UPDATED state on the selected PLMN.

If a new PLMN is entered, a MS which is attached for PS services shall perform a routeing area update if the LAI or the PLMN identity is not contained in any of the lists "forbidden LAs for roaming", "forbidden LAs for regional provision of service", "forbidden PLMNs for GPRS service" or "forbidden PLMNs" and if the current update status is different from "IDLE, NO IMSI".

An LR request indicating Periodic Location Updating is made when, in idle mode, the Periodic Location Updating timer expires while being in the non-GPRS update state UPDATED.

An LR request indicating Periodic Routing Area Update is made when the Periodic Routing Area Update timer expires while being in the GPRS update state UPDATED.

An LR request indicating IMSI attach is made when the MS is activated in the same location area in which it was deactivated while being in the non-GPRS update state UPDATED, and the system information indicates that IMSI attach/detach shall be used.

A GPRS attach is made by a GPRS MS when activated and capable of services which require registration. A GPRS attach may only performed if the selected PLMN is not contained in the list of "forbidden PLMNs for GPRS service". Depending on system information about GPRS network operation mode MSs operating in MS operation mode A or B perform combined or non-combined location registration procedures. When the combined routing area update or GPRS attach is accepted with indication "MSC not reachable" or is not answered the MS performs also the corresponding location updating procedure or falls back to a GPRS only MS. When the combined routing area update or GPRS attach is rejected with cause "GPRS not allowed" the GPRS update state is "IDLE, NO IMSI" and the MS performs the corresponding location updating procedure.

Furthermore, an LR request indicating Normal Location Updating is also made when the response to an outgoing request shows that the MS is unknown in the VLR or SGSN, respectively.

Table 2 in clause 5 summarizes the events in each state that trigger a new LR request. The actions that may be taken while being in the various states are also outlined in table 2.

A GPRS MS which is both IMSI attached for GPRS and non-GPRS services and which is capable of simultaneous operation of GPRS and non-GPRS services shall perform Routing Area Update in connected mode when it has entered

a new routing area which is not part of a LA contained in the list of "forbidden LAs for roaming" or "forbidden LAs for regional provision of service".

4.5.3 Periodic Location Registration

A Periodic Location Updating timer (for non-GPRS operation) and a Periodic Routing Area Update timer (for GPRS operation) with the following characteristics shall be implemented in the MS (MS capable of GPRS and non-GPRS operation shall implement both timers):

i) Upon switch on of the MS or when the system information indicates that periodic location registration shall be applied, and the timer is not running, the timer shall be loaded with a random value between 0 and the broadcast or signalled time-out value and started.

ii) The time-out value for the Periodic Location Updating timer shall be within the range of 1 deci-hour to 255 deci-hours with a granularity of 1 deci-hour.

iii) When the timer reaches its expiry value, it shall be initiated with respect to the relevant time-out value, and the MS shall initiate the Periodic Location Registration corresponding to the expired timer.

iv) The Periodic Location Updating timer shall be prevented from triggering Periodic Location Updating during connected mode. When the MS returns to idle mode, the Periodic Location Updating timer shall be initiated with respect to the broadcast time-out value, then started. Thereafter, the procedure in iii) shall be followed.

v) The Periodic Routing Area Update timer shall be prevented from triggering the Periodic Routing Area Update during Ready state. At transition from Ready to Standby state the Periodic Routing Area Update timer shall be initiated with respect to its time-out value, then started. Thereafter, the procedure in iii) shall be followed.

vi) If the MS performs a successful combined Routing Area Update the Periodic Location Updating timer shall be prevented from triggering the Periodic Location Updating until the MS starts using Location Updating procedure, for example because of a changed network operation mode or the MS uses non-GPRS services only.

vii) When a change in the time-out value occurs (at a change of serving cell or a change in the broadcast time-out value or a change in the signalled time-out value), the related timer shall be reloaded so that the new time to expiry will be: "old time to expiry" modulo "new time-out value".

4.5.4 IMSI attach/detach operation

The system information will contain an indicator indicating whether or not IMSI attach/detach operation is mandatory to use in the cell. The MS shall operate in accordance with the received value of the indicator.

A GPRS MS shall perform GPRS attach/detach procedures independent of the value of the IMSI attach/detach indicator. When a GPRS MS has to perform IMSI attach/detach independent of GPRS procedures (for example GPRS network operation mode 2) the handling described in the clause above applies.

When IMSI attach/detach operation applies, a MS shall send the IMSI detach message to the network when the MS is powered down or the SIM is removed while being in the update state UPDATED. The IMSI detach message will not be acknowledged by the network.

When the MS returns to the active state, the MS shall perform an LR request indicating IMSI attach, provided that the MS still is in the same registration area. If the registration area has changed, an LR request indicating Normal Location Updating according to clause 4.5.2 shall be performed.

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.

4.6 Service indication (A/Gb mode only)

This is an indication to the user that service or CTS service is available.

The service indication should be set if the following conditions are all satisfied:

a) Cell Selection: Camped on a suitable cell and in updated state, or in connected mode having been camped on a suitable cell.

b) Location registration: In updated state, for MSs capable of services requiring registration.

A specific CTS service indication should be set when the CTS MS is attached to a CTS FP.

However due to the fact that there may be some transitory changes of state, the service indication is permitted to continue to be set for up to 10 seconds after the above conditions cease to be met. Also the service indication is permitted to take up to 1 second to be set after the above conditions are met.

4.7 Pageability of the mobile subscriber

An MS is required to listen to all paging messages that could address it (see 3GPP TS 45.002~~05.02~~), when the following conditions are all satisfied:

- A SIM is inserted.
- The MS is camped on a cell.
- The MS is not in state "Idle, No IMSI".
- The MS is not performing the task to search for available PLMNs. (Whenever possible during this task, the MS should listen for paging.). However, when the MS is camped on a cell, is registered in a PLMN and is performing its regular search for the HPLMN, as specified in 3GPP TS 22.011, then it shall listen to all paging messages that could address it.

NOTE: In A/Gb mode, during cell reselection there is a certain period when the MS is no longer camped on the old cell but must decode the full BCCH or CPBCCH before camping on the new cell. This leads to a period of slightly more than 8 51 frame multiframes when the MS will not necessarily be pageable.

4.8 MM Restart Procedure

In some cases, e.g. on change of SIM data, there is a need for the MM to be restarted without the need for user intervention.

To perform the procedure the MS shall behave as if the SIM is removed and afterwards a new SIM is inserted.

3GPP TSG-CN1 Meeting #26 ***Tdoc N1-021947***
Miami Beach, Florida, USA, 23 – 27 September 2002

CR-Form-v7

CHANGE REQUEST

⌘ **23.122** **CR** **058** ⌘ **rev** **-** ⌘ Current version: **5.1.0** ⌘

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

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

Title:	⌘	Correction of references
Source:	⌘	Rapporteur (Nokia)
Work item code:	⌘	TEI
Date:	⌘	12/09/2002
Category:	⌘	**A**
Release:	⌘	Rel-5

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

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	Some references to pre-R99 GSM specifications still exist in 23.122
Summary of change:	⌘	Old and redundant references have been updated.
Consequences if not approved:	⌘	Contradictory and confusing specifications.

Clauses affected:	⌘				
Other specs affected:	⌘	**Y**	**N**		
			X	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘				

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

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.
2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.
3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

1.1 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document.*

[1] Void.~~3GPP TS 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".~~

[2] 3GPP TS 22.001: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Principles of circuit telecommunication services supported by a Public Land Mobile Network (PLMN)".

[3] 3GPP TS 22.002: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects; Circuit Bearer Services (BS) supported by a Public Land Mobile Network (PLMN)".

[4] 3GPP TS 22.003: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects; Circuit Teleservices supported by a Public Land Mobile Network (PLMN)".

[5] 3GPP TS 22.004: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects; General on supplementary services".

[6] Void.~~3GPP TS 02.06: "Digital cellular telecommunications system (Phase 2+); Types of Mobile Stations (MS)".~~

[7] Void.~~3GPP TS 02.07: "Digital cellular telecommunications system (Phase 2+); Mobile Station (MS) features".~~

[8] Void.~~3GPP TS 02.09: "Digital cellular telecommunications system (Phase 2+); Security aspects".~~

[9] 3GPP TS 22.011: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Service accessibility".

[10] 3GPP TS 22.016: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; International Mobile station Equipment Identities (IMEI)".

[11] Void.~~3GPP TS 02.17: "Digital cellular telecommunications system (Phase 2+); Subscriber Identity Modules; Functional Characteristics".~~

[12] 3GPP TS 22.024: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Description of Charge Advice Information (CAI)".

[13] 3GPP TS 22.030: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects; Man-Machine Interface (MMI) of the User Equipment (UE)".

[14] Void.~~3GPP TS 02.40: "Digital cellular telecommunications system (Phase 2+); Procedures for call progress indications".~~

[15] 3GPP TS 22.041: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Operator Determined Barring (ODB)".

[16] 3GPP TS 22.081: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Line identification Supplementary Services; Stage 1".

[17] 3GPP TS 22.082: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Call Forwarding (CF) supplementary services - Stage 1".

[18] 3GPP TS 22.083: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects; Call Waiting (CW) and Call Holding (HOLD); Supplementary Services - Stage 1".

[19] 3GPP TS 22.084: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects; MultiParty (MPTY) Supplementary Services - Stage 1".

[20] 3GPP TS 22.085: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects; Closed User Group (CUG) Supplementary Services - Stage 1".

[21] 3GPP TS 22.086: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Advice of Charge (AoC) Supplementary Services - Stage 1".

[22] 3GPP TS 22.088: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects; Call Barring (CB) Supplementary Services - Stage 1".

[23] 3GPP TS 24.008: "3rd Generation Partnership Project;Universal Mobile Telecommunications System; Mobile Radio Interface Layer 3 specification, Core Network Protocols - Stage 3".

[24] 3GPP TS 45.00205.02: "3rd Generation Partnership Project;Technical Specification Group GSM/EDGE;Radio Access NetworkDigital cellular telecommunications system (Phase 2+); Multiplexing and multiple access on the radio path".

[25] 3GPP TS 45.00805.08: "3rd Generation Partnership Project; Technical Specification Group GSM/EDGE;Radio Access NetworkDigital cellular telecommunications system (Phase 2+); Radio subsystem link control".

[26] 3GPP TS 22.060: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects; General Packet Radio Service (GPRS); Service description, Stage 1".

[27] 3GPP TS 23.060: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; General Packet Radio Service (GPRS); Service description;Stage 2".

[28] 3GPP TS 43.06403.64: "3rd Generation Partnership Project;Technical Specification Group GERAN;Digital cellular telecommunications system (Phase 2+);General Packet Radio Service (GPRS);Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Overall description of the GPRS Radio Interface; Stage 2".

[29] Void.3GPP TS 02.56: "Digital cellular telecommunications system (Phase 2+); GSM Cordless Telephony System (CTS); Service Description; Stage 1".

[30] Void.3GPP TS 03.56: "Digital cellular telecommunications system (Phase 2+); GSM Cordless Telephony System (CTS) Phase 1; CTS Architecture Description; Stage 2".

[31] 3GPP TS 25.101: "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; UE Radio transmission and Reception (FDD)".

[32] 3GPP TS 25.304: "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; UE Procedures in Idle Mode and Procedures for Cell Reselection in Connected Mode".

[33] 3GPP TS 25.331: "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; RRC Protocol Specification".

[34] 3GPP TS 44.01804.18:" 3rd Generation Partnership Project;Technical Specification Group GSM/EDGE Radio Access Network;Mobile radio interface layer 3 specification,Radio Resource Control Protocol Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 specification, Radio Resource Control Protocol".

[35] 3GPP TS 43.02203.22: "3rd Generation Partnership Project;Technical Specification Group GSM/EDGE Radio Access Network;Functions related to Mobile Station (MS) in idle mode and group receive mode Digital cellular telecommunications system (Phase 2+); Functions related to Mobile Station (MS) in idle mode and group receive mode".

[36] 3GPP TR 21.905: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Vocabulary for 3GPP Specifications".

[37] Void.~~3GPP TS 11.11: "Digital cellular telecommunications system (Phase 2+); Specification of the Subscriber Identity Module - Mobile Equipment (SIM - ME) interface".~~

[38] 3GPP TS 21.111: "3rd Generation Partnership Project; Technical Specification Group Terminals; USIM and IC card requirements".

[39] 3GPP TS 44.060: "3rd Generation Partnership Project;Technical Specification Group GSM/EDGE Radio Access Network;General Packet Radio Service (GPRS);Mobile Station (MS) - Base Station System (BSS) interface;Radio Link Control/Medium Access Control (RLC/MAC) protocol".

[40] 3GPP TS 31.102: "3rd Generation Partnership Project;Technical Specification Group Terminals;Characteristics of the USIM Application".

1.2 Definitions and abbreviations

For the purposes of the present document, the abbreviations defined in ~~3GPP TS 01.04 and~~ 3GPP TS 21.905 apply.

(A/Gb mode only): Indicates this clause applies only to GSM system. For multi system case this is determined by the current serving radio access network.

(Iu mode only): Indicates this clause applies only to UMTS system. For multi system case this is determined by the current serving radio access network.

Acceptable Cell: This is a cell that the MS may camp on to make emergency calls. It must satisfy criteria which is defined for A/Gb mode in 3GPP TS 43.022~~03.22~~ and for Iu mode in 3GPP TS 25.304.

Access Technology: The access technology associated with a PLMN. The MS uses this information to determine what type of radio carrier to search for when attempting to select a specific PLMN (e.g., GSM, UMTS or GSM COMPACT). A PLMN may support more than one access technology.

Allowable PLMN: In the case of a MS operating in MS operation mode A or B, **t**his is a PLMN which is not in the list of "forbidden PLMNs" in the MS. In the case of a MS operating in MS operation mode C, this is a PLMN which is not in the list of "forbidden PLMNs" or in the list of "forbidden PLMNs for GPRS service" in the MS

Available PLMN: For A/Gb mode this is a PLMN where the MS has found a cell that satisfies certain conditions specified in 3GPP TS 43.022~~ 03.22~~. For Iu mode this is a PLMN where the MS has found a cell that satisfies certain conditions specified in 3GPP TS 25.304.

Camped on a cell: The MS (ME if there is no SIM) has completed the cell selection/reselection process and has chosen a cell from which it plans to receive all available services. Note that the services may be limited, and that the PLMN may not be aware of the existence of the MS (ME) within the chosen cell.

Current serving cell: This is the cell on which the MS is camped.

CTS MS: An MS capable of CTS services is a CTS MS.

GPRS MS: An MS capable of GPRS services is a GPRS MS.

MS operation mode: See GSM 23.060~~03.60~~[27].

High quality signal: The high quality signal limit is used in the PLMN selection procedure. It is defined in the appropriate AS specification: GSM TS 43.022~~03.22~~ for the GSM radio access technology, 3GPP TS 25.304 for the UMTS radio access technology (FDD or TDD mode).

Home PLMN: This is a PLMN where the MCC and MNC of the PLMN identity match the MCC and MNC of the IMSI. Matching criteria are defined in Annex A.

In A/Gb mode,...: Indicates this clause applies only to GSM System. For multi system case this is determined by the current serving radio access network.

In Iu mode,...: Indicates this clause applies only to UMTS System. For multi system case this is determined by the current serving radio access network.

Localised Service Area (LSA): A localised service area consists of a cell or a number of cells. The cells constituting a LSA may not necessarily provide contiguous coverage.

Location Registration (LR): An MS which is IMSI attached to non-GPRS services only performs location registration by the Location Updating procedure. A GPRS MS which is IMSI attached to GPRS services or to GPRS and non-GPRS services performs location registration by the Routing Area Update procedure only when in a network of network operation mode I. Both procedures are performed independently by the GPRS MS when it is IMSI attached to GPRS and non-GPRS services in a network of network operation mode II or III (see 3GPP TS 23.060).

MS: Mobile Station. The present document makes no distinction between MS and UE.

Network Type: The network type associated with HPLMN or a PLMN on the PLMN selector (see GSM 31.102~~11.11~~). The MS uses this information to determine what type of radio carrier to search for when attempting to select a specific PLMN. A PLMN may support more than one network type.

Registered PLMN (RPLMN): This is the PLMN on which certain LR outcomes have occurred (see table 1).

Registration: This is the process of camping on a cell of the PLMN and doing any necessary LRs.

Registration Area: A registration area is an area in which mobile stations may roam without a need to perform location registration. The registration area corresponds to location area (LA) for performing location updating procedure and it corresponds to routing area for performing the routing area update procedure.

The PLMN to which a cell belongs (PLMN identity) is given in the system information transmitted on the BCCH (MCC + MNC part of LAI).

Selected PLMN: This is the PLMN that has been selected according to clause 3.1, either manually or automatically.

SIM: Subscriber Identity Module (see 3GPP TS ~~02.17~~21.111). The present document makes no distinction between SIM and USIM.

SoLSA exclusive access: Cells on which normal camping is allowed only for MS with Localised Service Area (LSA) subscription.

Suitable Cell: This is a cell on which an MS may camp. It must satisfy criteria which is defined for A/Gb mode in 3GPP TS 43.022~~03.22~~ and for Iu mode in 3GPP TS 25.304.

Visited PLMN of home country: This is a PLMN, different from the home PLMN, where the MCC part of the PLMN identity is the same as the MCC of the IMSI.

Visited PLMN: This is a PLMN, different from the home PLMN.

2 General description of idle mode

When an MS is switched on, it attempts to make contact with a public land mobile network (PLMN). The particular PLMN to be contacted may be selected either automatically or manually.

The MS looks for a suitable cell of the chosen PLMN and chooses that cell to provide available services, and tunes to its control channel. This choosing is known as "camping on the cell". The MS will then register its presence in the registration area of the chosen cell if necessary, by means of a location registration (LR), GPRS attach or IMSI attach procedure.

If the MS loses coverage of a cell, or find a more suitable cell, it reselects onto the most suitable cell of the selected PLMN and camps on that cell. If the new cell is in a different registration area, an LR request is performed.

If the MS loses coverage of a PLMN, either a new PLMN is selected automatically, or an indication of which PLMNs are available is given to the user, so that a manual selection can be made.

Registration is not performed by MSs only capable of services that need no registration.

The purpose of camping on a cell in idle mode is fourfold:

a) It enables the MS to receive system information from the PLMN.

b) If the MS wishes to initiate a call, it can do this by initially accessing the network on the control channel of the cell on which it is camped (with the exceptions defined in 3GPP TS 43.022~~03.22~~ clauses 3.5.3 and 3.5.4 and 3GPP TS 25.304).

c) If the PLMN receives a call for the MS, it knows (in most cases) the registration area of the cell in which the MS is camped. It can then send a "paging" message for the MS on control channels of all the cells in the registration area. The MS will then receive the paging message because it is tuned to the control channel of a cell in that registration area, and the MS can respond on that control channel.

d) It enables the MS to receive cell broadcast messages.

If the MS is unable to find a suitable cell to camp on, or the SIM is not inserted, or if it receives certain responses to an LR request (e.g., "illegal MS"), it attempts to camp on a cell irrespective of the PLMN identity, and enters a "limited service" state in which it can only attempt to make emergency calls.

In A/Gb mode, if the CTS MS is in CTS mode only or in automatic mode with CTS preferred, it will start by attempting to find a CTS fixed part on which it is enrolled

The idle mode tasks can be subdivided into 4 processes:

- PLMN selection;
- Cell selection and reselection;
- Location registration;
- CTS fixed part selection (A/Gb mode only).

In A/Gb mode, to make this initial CTS fixed part selection, the MS shall be enrolled on at least one fixed part.

The relationship between these processes is illustrated in figure 1 in clause 5. The states and state transitions within each process are shown in figures 2 to 4 in clause 5.

3 Requirements and technical solutions

The following clauses 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 PLMNs" 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 PLMNs" 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".

3.2 Regional provision of service

An MS may have a "regionally restricted service" where it can only obtain service on certain LAs. If such an MS attempts to camp on a cell of an LA for which it does not have service entitlement, when it does an LR request, it will receive an "LA not allowed" message. In this case:

- The MS stores the forbidden LA identity (LAI) in a list of "forbidden LAs for regional provision of service", to prevent repeated access attempts on a cell of the forbidden LA. This list is deleted when the MS is switched off or the SIM is removed. The MS enters the limited service state.

In A/Gb mode, a cell may be reserved for SoLSA exclusive access (see 3GPP TS 24.008 and 3GPP TS 44.060 ~~04.60~~). An MS is only allowed to camp normally on such a cell if it has a Localised Service Area subscription to the cell. Other MS may enter the limited service state.

NOTE: In A/Gb mode, in a SoLSA exclusive cell the MCC+MNC code is replaced by an unique escape PLMN code (see 3GPP TS 23.073), not assigned to any PLMN, in SI3 and SI4. An MS not supporting SoLSA may request for location update to an exclusive access cell. In this case the location attempt is rejected with the cause "PLMN not allowed" and the escape PLMN code is added to the list of the "forbidden PLMNs".

3.3 Borders between registration areas

If the MS is moving in a border area between registration areas, it might repeatedly change between cells of different registration areas. Each change of registration area would require an LR, which would cause a heavy signalling load and increase the risk of a paging message being lost. The access stratum shall provide a mechanism to limit this effect.

3.4 Access control

3.4.1 Access control

Due to problems in certain areas, Network Operators may decide to restrict access from some MSs (e.g., in case of congestion), and for this reason an access control mechanism shall be provided.

3.4.2 Forbidden LA for regional provision of service

When the MS is camped on a cell, the LA of which belongs to the list of "forbidden LAs for regional provision of service", the MS is not allowed to initiate establishment of a CM connection except for an emergency call; it may respond to paging. Also, the MS is not allowed to request GPRS services when camped on a cell of a LA of which belongs to the list of "forbidden LAs for regional provision of service".

3.5 No suitable cell (limited service state)

There are a number of situations in which the MS is unable to obtain normal service from a PLMN. These include:

a) Failure to find a suitable cell of the selected PLMN;

b) No SIM in the MS;

c) A "PLMN not allowed" response to an LR;

d) An "illegal MS", "illegal ME" or "IMSI unknown in HLR" response to an LR; (Any SIM in the ME is then considered "invalid".)

e) A "GPRS not allowed" response to an LR of a GPRS MS attached to GPRS services only. (The cell selection state of GPRS MSs attached to GPRS and non-GPRS depends on the outcome of the location updating.)

(In automatic PLMN selection mode, events (a), (c) and (e) would normally cause a new PLMN selection, but even here, the situation may arise when no PLMNs are available and allowable for use).

Under any of these conditions, the MS attempts to camp on an acceptable cell, irrespective of its PLMN identity, so that emergency calls can be made if necessary. When in the limited service state with a valid SIM, the MS shall search for available and allowable PLMNs in the manner described in clause 4.4.3.1 and when indicated in the SIM also as described in clause 4.4.3.4. No LR requests are made until a valid SIM is present and either a suitable cell is found or a manual network reselection is performed. In the limited service state the presence of the MS need not be known to the PLMN on whose cell it has camped.

There are also other conditions under which only emergency calls may be made. These are shown in table 2 in clause 5.

3.6 CTS fixed part selection (A/Gb mode only)

In CTS mode only or in automatic mode with CTS preferred, the CTS MS normally operates on a CTS fixed part on which the mobile station is already enrolled. If the CTS MS loses CTS coverage in these modes, it shall attempt periodically to select again a CTS fixed part.

To select a CTS fixed part, the CTS MS shall listen to the CTSBCH frequencies of all the fixed parts on which the MS is currently enrolled.

If the CTS MS is moving in a border area between one area with CTS coverage and one without it, it might repeatedly require CTS attachments and LU on the PLMN. To prevent this, the criteria C1_CTS and C2_CTS (defined in 3GPP TS 45.008~~05.08~~ clause 11.1) are used. To attach to a CTS FP, the C1_CTS criterion shall be greater than zero. When the C2_CTS criterion falls below zero, the CTS MS shall consider itself to be no more under CTS coverage.

4 Overall process structure

4.1 Process goal

The aim of the idle mode processes is to ensure that the registered PLMN is the selected PLMN.

4.2 States description

Each of the processes of PLMN selection, cell selection and location registration can be described by a set of states. The overall state of the mobile is thus a composite of the states of the three processes. In some cases, an event which causes a change of state in one process may trigger a change of state in another process, e.g., camping on a cell in a new registration area triggers an LR request. The relationship between the processes is illustrated in figure 1 in clause 5.

The states in which the MS may be, for each of the processes, are described below and illustrated in figures 2 to 4 in clause 5. For many of the states, a fuller description can be found in other Technical Specifications, and a reference to the Technical Specification is given after the state description.

In the event of any conflict between the diagrams and the text in the present document, the text takes precedence.

4.3 List of states

4.3.1 List of states for the PLMN selection process

4.3.1.1 List of states for automatic mode (figure 2a)

A1 Trying RPLMN - The MS is trying to perform a Location Registration on the registered PLMN.

A2 On PLMN - The MS has successfully registered on a PLMN.

A3 Trying PLMN - The MS is trying to register on a PLMN in the ordered list of PLMNs.

A4 Wait for PLMNs to appear - There are no allowable and available PLMNs at present and the MS is waiting for one to appear.

A5 HPLMN search in progress - The MS is trying to find if the HPLMN is available.

A6 No SIM - There is no SIM in the MS, or certain LR responses have been received.

4.3.1.2 List of states for manual mode (figure 2b)

M1 Trying registered PLMN - The MS is trying to perform a Location Registration on the registered PLMN.

M2 On PLMN - The MS has successfully registered on a PLMN.

M3 Not on PLMN - The MS has failed to register on the selected PLMN.

M4 Trying PLMN - The MS is trying to register on a user selected PLMN.

M5 No SIM - There is no SIM in the MS, or certain LR responses have been received.

4.3.2 List of states for location updating (figure 3)

The states are entered depending on responses to location update (LU) requests.

4.3.3 List of states for location registration (figure 3)

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 clause 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 clause 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]

4.4 PLMN selection process

4.4.1 Introduction

There are two modes for PLMN selection, automatic and manual. These are described in clauses 4.4.3 below and illustrated in figures 2a to 2b in clause 5.

4.4.2 Registration on a PLMN

The MS shall perform registration on the PLMN if the MS is capable of services which require registration. In both automatic and manual modes, the concept of registration on a PLMN is used. An MS successfully registers on a PLMN if:

a) The MS has found a suitable cell of the PLMN to camp on; and

b) An LR request from the MS has been accepted in the registration area of the cell on which the MS is camped (see table 1).

4.4.3 PLMN selection

The registration on the selected PLMN and the location registration are only necessary if the MS is capable of services which require registration. Otherwise, the PLMN selection procedures are performed without registration.

The "HPLMN Selector with Access Technology", "User Controlled PLMN Selector with Access Technology" and "Operator Controlled PLMN Selector with Access Technology" data fields in the SIM include associated access technologies for each PLMN entry, see GSM 31.102~~11.11 [37]~~. The PLMN/access technology combinations are listed

in priority order. If an entry includes more than one access technology, then no priority is defined for the preferred access technology and the priority is an implementation issue.

The Mobile Equipment stores a list of "equivalent PLMNs". This list is replaced or deleted at the end of each location update procedure, routing area update procedure and GPRS attach procedure. The stored list consists of a list of equivalent PLMNs as downloaded by the network plus the PLMN code of the network that downloaded the list. All PLMNs in the stored list are regarded as equivalent to each other for PLMN selection, cell selection/re-selection and handover.

The MS shall not use the PLMN codes contained in the "HPLMN Selector with Access Technology" data field.

NOTE 1: To allow provision for multiple HPLMN codes, the HPLMN access technologies are stored on the SIM together with PLMN codes. This version of the specification does not support multiple HLPMN codes and the "HPLMN Selector with Access Technology" data field is only used by the MS to get the HPLMN access technologies. The HPLMN code is the PLMN code included in the IMSI.

NOTE 2: Different GSM frequency bands (eg. 900, 1800, 1900, 400) are all considered GSM access technology. An MS supporting more than one band should scan all the bands it's supports when scanning for GSM frequencies. However GSM COMPACT systems which use GSM frequency bands but with the CBPCCH broadcast channel are considered as a separate access technology from GSM.

4.4.3.1 At switch-on or recovery from lack of coverage

At switch on, or following recovery from lack of coverage,the MS selects the registered PLMN or equivalent PLMN (if it is available) using all access technologies that the MS is capable of and if necessary (in the case of recovery from lack of coverage, see clause 4.5.2) attempts to perform a Location Registration.

EXCEPTION: In A/Gb mode or GSM COMPACT, an MS with voice capability, shall not search for CPBCCH carriers, unless the "RPLMN Last Used Access Technology" field is available in the SIM and indicates GSM COMPACT. In A/Gb mode or GSM COMPACT, an MS not supporting packet services shall not search for CPBCCH carriers.

If successful registration is achieved, the MS indicates the selected PLMN.

If there is no registered PLMN, or if registration is not possible due to the PLMN being unavailable or registration failure, the MS follows one of the following two procedures depending on its operating mode.

EXCEPTION: If registration is not possible on recovery from lack of coverage due to the registered PLMN being unavailable, a MS attached to GPRS services may, optionally, continue looking for the registered PLMN for an implementation dependent time.

NOTE: A MS attached to GPRS services should use the above exception only if one or more PDP contexts are currently active.

4.4.3.1.1 Automatic Network Selection Mode Procedure

The MS selects and attempts registration on other PLMNs, if available and allowable, in the following order:

i) HPLMN (if not previously selected);

ii) each PLMN in the "User Controlled PLMN Selector with Access Technology" data field in the SIM (in priority order);

iii) each PLMN in the "Operator Controlled PLMN Selector with Access Technology" data field in the SIM (in priority order);

iv) other PLMN/access technology combinations with received high quality signal in random order;

v) other PLMN/access technology combinations in order of decreasing signal quality.

When following the above procedure the following requirements apply:

a) An MS with voice capability shall ignore PLMNs for which the MS has identified at least one GSM COMPACT.

b) In A/Gb mode or GSM COMPACT, an MS with voice capability, or an MS not supporting packet services shall not search for CPBCCH carriers.

c) In ii and iii, the MS should limit its search for the PLMN to the access technology or access technologies associated with the PLMN in the appropriate PLMN Selector with Access Technology list (User Controlled or Operator Controlled selector list). An MS using a SIM without access technology information storage (i.e. the "User Controlled PLMN Selector with Access Technology" and the "Operator Controlled PLMN Selector with Access Technology" data fields are not present) shall instead use the "PLMN Selector" data field, for each PLMN in the "PLMN Selector" data field, the MS shall search for all access technologies it is capable of and shall assume GSM access technology as the highest priority radio access technology.

d) In iv and v, the MS shall search for all access technologies it is capable of, before deciding which PLMN to select.

e) In ii, and iii, a packet only MS which supports GSM COMPACT, but using a SIM without access technology information storage (i.e. the "User Controlled PLMN Selector with Access Technology" and the "Operator Controlled PLMN Selector with Access Technology" data fields are not present) shall instead use the "PLMN Selector" data field, for each PLMN in the "PLMN Selector" data field, the MS shall search for all access technologies it is capable of and shall assume GSM COMPACT access technology as the lowest priority radio access technology.

f) In i, the MS shall search for all access technologies it is capable of. The MS shall start its search using the access technologies stored in the "HPLMN Selector with Access Technology" data field on the SIM in priority order as defined in clause 4.4.3 (i.e. the PLMN/access technology combinations are listed in priority order, if an entry includes more than one access technology then no priority is defined for the preferred access technology and the priority is an implementation issue).

g) In i, an MS using a SIM without access technology information storage (i.e. the "HPLMN Selector with Access Technology" data field is not present) shall search for all access technologies it is capable of and shall assume GSM access technology as the highest priority radio access technology. A packet only MS which supports GSM COMPACT using a SIM without access technology information storage shall also assume GSM COMPACT access technology as the lowest priority radio access technology.

h) In v, the MS shall order the PLMN/access technology combinations in order of decreasing signal quality within each access technology. The order between PLMN/access technology combinations with different access technologies is an MS implementation issue.

NOTE 1: Requirements a) and b) apply also to requirement d), so a GSM voice capable MS should not search for GSM COMPACT PLMNs, even if capable of GSM COMPACT.

NOTE 2: Requirements a) and b) apply also to requirement f), so a GSM voice capable MS should not search for GSM COMPACT PLMNs, even if this is the only access technology on the "HPLMN Selector with Access Technology" data field on the SIM.

NOTE 3: High quality signal is defined in the appropriate AS specification.

If successful registration is achieved, the MS indicates the selected PLMN.

If registration cannot be achieved because no PLMNs are available and allowable, the MS indicates "no service" to the user, waits until a new PLMN is available and allowable and then repeats the procedure.

If there were one or more PLMNs which were available and allowable, but an LR failure made registration on those PLMNs unsuccessful or an entry in any of the lists "forbidden LAs for roaming", or "forbidden LAs for regional provision of service" prevented a registration attempt, the MS selects the first such PLMN again and enters a limited service state.

4.4.3.1.2 Manual Network Selection Mode Procedure

The MS indicates whether there are any PLMNs, which are available using all supported access technologies. This includes PLMNs in the "forbidden PLMNs" list and PLMNs which only offer services not supported by the MS. An MS which supports GSM COMPACT shall also indicate GSM COMPACT PLMNs (which use PBCCH).

If displayed, PLMNs meeting the criteria above are presented in the following order:

i)- HPLMN;

ii)- PLMNs contained in the " User Controlled PLMN Selector with Access Technology " data field in the SIM (in priority order);

iii)- PLMNs contained in the "Operator Controlled PLMN Selector with Access Technology" data field in the SIM (in priority order);

iv)- other PLMN/access technology combinations with received high quality signal in random order;

v)- other PLMN/access technology combinations in order of decreasing signal quality.

In ii and iii, an MS using a SIM without access technology information storage (i.e. the "User Controlled PLMN Selector with Access Technology" and the "Operator Controlled PLMN Selector with Access Technology" data fields are not present) shall instead present the PLMNs contained in the "PLMN Selector" data field in the SIM (in priority order).

In v, requirement h) in clause 4.4.3.1.1 applies.

In GSM COMPACT, the non support of voice services shall be indicated to the user.

The user may select his desired PLMN and the MS then initiates registration on this PLMN using the access technology chosen by the user for that PLMN or using the highest priority available access technology for that PLMN, if the associated access technologies have a priority order. (This may take place at any time during the presentation of PLMNs). For such a registration, the MS shall ignore the contents of the "forbidden LAs for roaming", "forbidden LAs for regional provision of service", "forbidden PLMNs for GPRS service" and "forbidden PLMNs" lists.

NOTE 1: It is an MS implementation option whether to indicate access technologies to the user. If the MS does display access technologies, then the access technology used should be the access technology chosen by the user for that PLMN. If the MS does not display access technologies, then the access technology chosen for a particular PLMN should be the highest priority available access technology for that PLMN, if the associated access technologies have a priority order.

If the user does not select a PLMN, the selected PLMN shall be the one that was selected before the PLMN selection procedure started. If no such PLMN was selected or that PLMN is no longer available, then the MS shall attempt to camp on any acceptable cell and enter the limited service state.

NOTE 2: High quality signal is defined in the appropriate AS specification.

4.4.3.2 User reselection

At any time the user may request the MS to initiate reselection and registration onto an available PLMN, according to the following procedures, dependent upon the operating mode.

4.4.3.2.1 Automatic Network Selection Mode

The MS selects and attempts registration on PLMNs, if available and allowable, in all of its bands of operation in accordance with the following order:

i) HPLMN;

ii) PLMNs contained in the " User Controlled PLMN Selector with Access Technology" data field in the SIM (in priority order) excluding the previously selected PLMN;

iii) PLMNs contained in the "Operator Controlled PLMN Selector with Access Technology" data field in the SIM (in priority order) excluding the previously selected PLMN;

iv) other PLMN/access technology combinations with the received high quality signal in random order excluding the previously selected PLMN;

v) other PLMN/access technology combinations, excluding the previously selected PLMN in order of decreasing signal quality or, alternatively, the previously selected PLMN may be chosen ignoring its signal quality;

vi) The previously selected PLMN.

The previously selected PLMN is the PLMN which the MS has selected prior to the start of the user reselection procedure.

NOTE 1: If the previously selected PLMN is chosen, and registration has not been attempted on any other PLMNs, then the MS is already registered on the PLMN, and so registration is not necessary.

The equivalent PLMNs list shall not be applied to the user reselection in Automatic Network Selection Mode.

When following the above procedure the requirements a), b), c), e), f), g), h) in clause 4.4.3.1.1 apply: Requirement d) shall apply as shown below:

d) In iv, v, and vi, the MS shall search for all access technologies it is capable of before deciding which PLMN to select.

NOTE 2: High quality signal is defined in the appropriate AS specification.

4.4.3.2.2 Manual Network Selection Mode

The Manual Network Selection Mode Procedure of clause 4.4.3.1.2 is followed.

4.4.3.3 In VPLMN

If the MS is in a VPLMN, the MS shall periodically attempt to obtain service on its HPLMN or higher priority PLMN listed in "user controlled PLMN selector" or "operator controlled PLMN selector" by scanning in accordance with the requirements that are applicable to i), ii) and iii) as defined in the Automatic Network Selection Mode in clause 4.4.3.1.1. In the case that the mobile has a stored "Equivalent PLMNs" list the mobile shall only select a PLMN if it is of a higher priority than those of the same country as the current serving PLMN which are stored in the "Equivalent PLMNs" list. For this purpose, a value T minutes may be stored in the SIM, T is either in the range 6 minutes to 8 hours in 6 minute steps or it indicates that no periodic attempts shall be made. If no value is stored in the SIM, a default value of 60 minutes is used.

The attempts to access the HPLMN or higher priority PLMN shall be as specified below:

a) The periodic attempts shall only be performed in automatic mode when the MS is roaming;

b) After switch on, a period of at least 2 minutes and at most T minutes shall elapse before the first attempt is made;

c) The MS shall make an attempt if the MS is on the VPLMN at time T after the last attempt;

d) Periodic attempts shall only be performed by the MS while in idle mode;

e) If the HPLMN or higher priority PLMN is not found, the MS shall remain on the VPLMN.

f) In steps i), ii) and iii) the MS shall limit its attempts to access higher priority PLMNs to PLMNs of the same country as the current serving VPLMN.

g) Only the priority levels of Equivalent PLMNs of the same country as the current serving VPLMN shall be taken into account to compare with the priority level of a selected PLMN.

4.4.3.4 Investigation Scan for higher prioritized PLMN

The support of this procedure is mandatory if the ME supports GSM COMPACT and otherwise optional.

A MS capable of both GSM voice and packet service shall, when indicated in the SIM, investigate if there is service from a higher prioritized PLMN not offering GSM voice service, either HPLMN or a PLMN in a "PLMN Selector with Access Technology " data field on the SIM.

The MS shall scan for PLMNs in accordance with the requirements described for automatic network selection mode in clause 4.4.3.1.1 that are applicable to i), ii) and iii) with the exception of requirement a) and b) in clause 4.4.3.1. Requirement a) and b) that are specified for automatic network selection mode in clause 4.4.3.1 shall be ignored during the investigation scan.

If indicated on the SIM, the investigation scan shall be performed:

i) After each successful PLMN selection and registration is completed, when the MS is in idle mode. This investigation scan may rely on the information from the already performed PLMN selection and may not necessarily require a rescan

ii) When the MS is unable to obtain normal service from a PLMN, (limited service state) see clause 3.5.

The investigation scan is restricted to automatic selection mode and shall only be performed by an MS that is capable of both voice and packet data. It shall only be performed if the selected PLMN is not already the highest prioritized PLMN in the current country. (HPLMN in home country, otherwise according to PLMN selector lists)

The MS shall return to RPLMN after the investigation scan is performed.

If a higher prioritized PLMN not offering GSM voice service is found, this shall be indicated to the user. The MS shall not select the PLMN unless requested by the user.

4.4.4 Abnormal cases

If there is no SIM in the MS, if there is an authentication failure, or if the MS receives an "IMSI unknown in HLR", "illegal ME" or "illegal MS" response to an LR request, then effectively there is no selected PLMN ("No SIM" state). In these cases, the states of the cell selection process are such that no PLMN selection information is used. No further attempts at registration on any PLMN are made until the MS is switched off and on again, or a SIM is inserted.

When in Automatic Network Selection mode and the MS is in the "not updated" state with one or more suitable cells to camp on; then after the maximum allowed unsuccessful LR requests (controlled by the specific attempt counters) the MS may continue (or start if it is not running) the user reselection procedure of 4.4.3.2 1.

4.4.5 Roaming not allowed in this LA

If in either PLMN selection mode the LR response "Roaming not allowed in this LA" is received:

> The PLMN Automatic or Manual Mode Selection Procedure of clause 4.4.3.1 are followed, depending on whether the MS is in automatic or manual mode.

4.5 Location registration process

4.5.1 General

When the MS is switched on and capable of services requiring registration, the action taken by the location registration process is as follows:

a) SIM present and no LR needed (because of the status of the stored registration area identity and "attach" flag): The MS is in the update state UPDATED;

b) SIM present and LR needed: A LR request is made;

c) No SIM present: The MS enters the update state Idle, NO IMSI.

In case b) above, and subsequently whenever a LR request is made, the MS enters a state depending on the outcome of the LR request, as listed in clause 4.3.2 above. In case c) the GPRS and the non-GPRS update state enters "IDLE, NO IMSI".

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

4.5.2 Initiation of Location Registration

An LR request indicating Normal Updating is made when, in idle mode,

- the MS changes cell while being in the update state NOT UPDATED; (for MS capable of GPRS and non-GPRS services when at least one of both update states is NOT UPDATED)
- the MS detects that it has entered a new registration area, i.e., when the received registration area identity differs from the one stored in the MS, and the LAI or the PLMN identity is not contained in any of the lists of "forbidden LAs for roaming", "forbidden LAs for regional provision of service", "forbidden PLMNs for GPRS service" or "forbidden PLMNs" respectively, while being in one of the following update states:
  - UPDATED;
  - NOT UPDATED;
  - ROAMING NOT ALLOWED.
- the Periodic Location Updating Timer expires while being in the non-GPRS update state NOT UPDATED (triggers Location Updating);
- the Periodic Routing Area Update timer expires while being in the GPRS update state NOT UPDATED (triggers Routing Area Update);
- a manual network reselection has been performed, an acceptable cell of the selected PLMN is present, and the MS is not in the UPDATED state on the selected PLMN.

If a new PLMN is entered, a MS which is attached for PS services shall perform a routeing area update if the LAI or the PLMN identity is not contained in any of the lists "forbidden LAs for roaming", "forbidden LAs for regional provision of service", "forbidden PLMNs for GPRS service" or "forbidden PLMNs" and if the current update status is different from "IDLE, NO IMSI".

An LR request indicating Periodic Location Updating is made when, in idle mode, the Periodic Location Updating timer expires while being in the non-GPRS update state UPDATED.

An LR request indicating Periodic Routing Area Update is made when the Periodic Routing Area Update timer expires while being in the GPRS update state UPDATED.

An LR request indicating IMSI attach is made when the MS is activated in the same location area in which it was deactivated while being in the non-GPRS update state UPDATED, and the system information indicates that IMSI attach/detach shall be used.

A GPRS attach is made by a GPRS MS when activated and capable of services which require registration. A GPRS attach may only performed if the selected PLMN is not contained in the list of "forbidden PLMNs for GPRS service". Depending on system information about GPRS network operation mode MSs operating in MS operation mode A or B perform combined or non-combined location registration procedures. When the combined routing area update or GPRS attach is accepted with indication "MSC not reachable" or is not answered the MS performs also the corresponding location updating procedure or falls back to a GPRS only MS. When the combined routing area update or GPRS attach is rejected with cause "GPRS not allowed" the GPRS update state is "IDLE, NO IMSI" and the MS performs the corresponding location updating procedure.

Furthermore, an LR request indicating Normal Location Updating is also made when the response to an outgoing request shows that the MS is unknown in the VLR or SGSN, respectively.

Table 2 in clause 5 summarizes the events in each state that trigger a new LR request. The actions that may be taken while being in the various states are also outlined in table 2.

A GPRS MS which is both IMSI attached for GPRS and non-GPRS services and which is capable of simultaneous operation of GPRS and non-GPRS services shall perform Routing Area Update in connected mode when it has entered a new routing area which is not part of a LA contained in the list of "forbidden LAs for roaming" or "forbidden LAs for regional provision of service".

4.5.3 Periodic Location Registration

A Periodic Location Updating timer (for non-GPRS operation) and a Periodic Routing Area Update timer (for GPRS operation) with the following characteristics shall be implemented in the MS (MS capable of GPRS and non-GPRS operation shall implement both timers):

i) Upon switch on of the MS or when the system information indicates that periodic location registration shall be applied, and the timer is not running, the timer shall be loaded with a random value between 0 and the broadcast or signalled time-out value and started.

ii) The time-out value for the Periodic Location Updating timer shall be within the range of 1 deci-hour to 255 deci-hours with a granularity of 1 deci-hour.

iii) When the timer reaches its expiry value, it shall be initiated with respect to the relevant time-out value, and the MS shall initiate the Periodic Location Registration corresponding to the expired timer.

iv) The Periodic Location Updating timer shall be prevented from triggering Periodic Location Updating during connected mode. When the MS returns to idle mode, the Periodic Location Updating timer shall be initiated with respect to the broadcast time-out value, then started. Thereafter, the procedure in iii) shall be followed.

v) The Periodic Routing Area Update timer shall be prevented from triggering the Periodic Routing Area Update during Ready state. At transition from Ready to Standby state the Periodic Routing Area Update timer shall be initiated with respect to its time-out value, then started. Thereafter, the procedure in iii) shall be followed.

vi) If the MS performs a successful combined Routing Area Update the Periodic Location Updating timer shall be prevented from triggering the Periodic Location Updating until the MS starts using Location Updating procedure, for example because of a changed network operation mode or the MS uses non-GPRS services only.

vii) When a change in the time-out value occurs (at a change of serving cell or a change in the broadcast time-out value or a change in the signalled time-out value), the related timer shall be reloaded so that the new time to expiry will be: "old time to expiry" modulo "new time-out value".

4.5.4 IMSI attach/detach operation

The system information will contain an indicator indicating whether or not IMSI attach/detach operation is mandatory to use in the cell. The MS shall operate in accordance with the received value of the indicator.

A GPRS MS shall perform GPRS attach/detach procedures independent of the value of the IMSI attach/detach indicator. When a GPRS MS has to perform IMSI attach/detach independent of GPRS procedures (for example GPRS network operation mode 2) the handling described in the clause above applies.

When IMSI attach/detach operation applies, a MS shall send the IMSI detach message to the network when the MS is powered down or the SIM is removed while being in the update state UPDATED. The IMSI detach message will not be acknowledged by the network.

When the MS returns to the active state, the MS shall perform an LR request indicating IMSI attach, provided that the MS still is in the same registration area. If the registration area has changed, an LR request indicating Normal Location Updating according to clause 4.5.2 shall be performed.

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.

4.6 Service indication (A/Gb mode only)

This is an indication to the user that service or CTS service is available.

The service indication should be set if the following conditions are all satisfied:

a) Cell Selection: Camped on a suitable cell and in updated state, or in connected mode having been camped on a suitable cell.

b) Location registration: In updated state, for MSs capable of services requiring registration.

A specific CTS service indication should be set when the CTS MS is attached to a CTS FP.

However due to the fact that there may be some transitory changes of state, the service indication is permitted to continue to be set for up to 10 seconds after the above conditions cease to be met. Also the service indication is permitted to take up to 1 second to be set after the above conditions are met.

4.7 Pageability of the mobile subscriber

An MS is required to listen to all paging messages that could address it (see 3GPP TS 45.002 ~~05.02~~), when the following conditions are all satisfied:

- A SIM is inserted.
- The MS is camped on a cell.
- The MS is not in state "Idle, No IMSI".
- The MS is not performing the task to search for available PLMNs. (Whenever possible during this task, the MS should listen for paging.). However, when the MS is camped on a cell, is registered in a PLMN and is performing its regular search for the HPLMN, as specified in 3GPP TS 22.011, then it shall listen to all paging messages that could address it.

NOTE: In A/Gb mode, during cell reselection there is a certain period when the MS is no longer camped on the old cell but must decode the full BCCH or CPBCCH before camping on the new cell. This leads to a period of slightly more than 8 51 frame multiframes when the MS will not necessarily be pageable.

4.8 MM Restart Procedure

In some cases, e.g. on change of SIM data, there is a need for the MM to be restarted without the need for user intervention.

To perform the procedure the MS shall behave as if the SIM is removed and afterwards a new SIM is inserted.

3GPP TSG-CN1 Meeting #27 ***Tdoc N1-022270***
Bangkok, Thailand, 11 – 15 November 2002

CR-Form-v7

CHANGE REQUEST

⌘ **23.009** **CR** **081** ⌘ **rev** **2** ⌘ Current version: **3.11.0** ⌘

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

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

Title:	⌘	MSC_A_HO SDL correction
Source:	⌘	Nortel Networks
Work item code:	⌘	TEI
Date:	⌘	Oct. 31, 2002
Category:	⌘	**F**
Release:	⌘	R99

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

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
Rel-4 (Release 4)
Rel-5 (Release 5)
Rel-6 (Release 6)

Reason for change: ⌘

In GSM 03.09 v7.0.0, the SDL diagram for “Procedure MSC_A_HO Sheet4(26)” shows that when a Clear Request from BSS-b is received, the MSC releases resources on BSS-b and transitions to the "Wait for Access by MS on BSS" state. The MSC waits until the T102 timer expires and connection reverts back to BSS-A.

However in 23.009, the same SDL diagram shows that when a Clear Request from BSS-b is received, the MSC release resources on BSS-b, then MSC enters the "decision box" of "Wait for MS on BSS-b".

The missing MSC_A_HO and MSC_B_HO SDLs from 03.09 were included in 23.009 v3.2.0 (v3.2.1 was editorial).

There is no evidence of an approved CR that makes this change between 03.09 v7.0.0 and 23.009 v3.2.0.

The SDL in 23.009 is incorrect and must be changed back to what is in 03.09.

Summary of change: ⌘ Correct the SDL for “Procedure MSC_A_HO Sheet4(26)”

Consequences if not approved: ⌘ Inconsistent with the SDL from previous releases.

Clauses affected: ⌘ 15 (Figure 41)

Other specs affected: ⌘

Y	N	
	X	Other core specifications
	X	Test specifications
	X	O&M Specifications

⌘

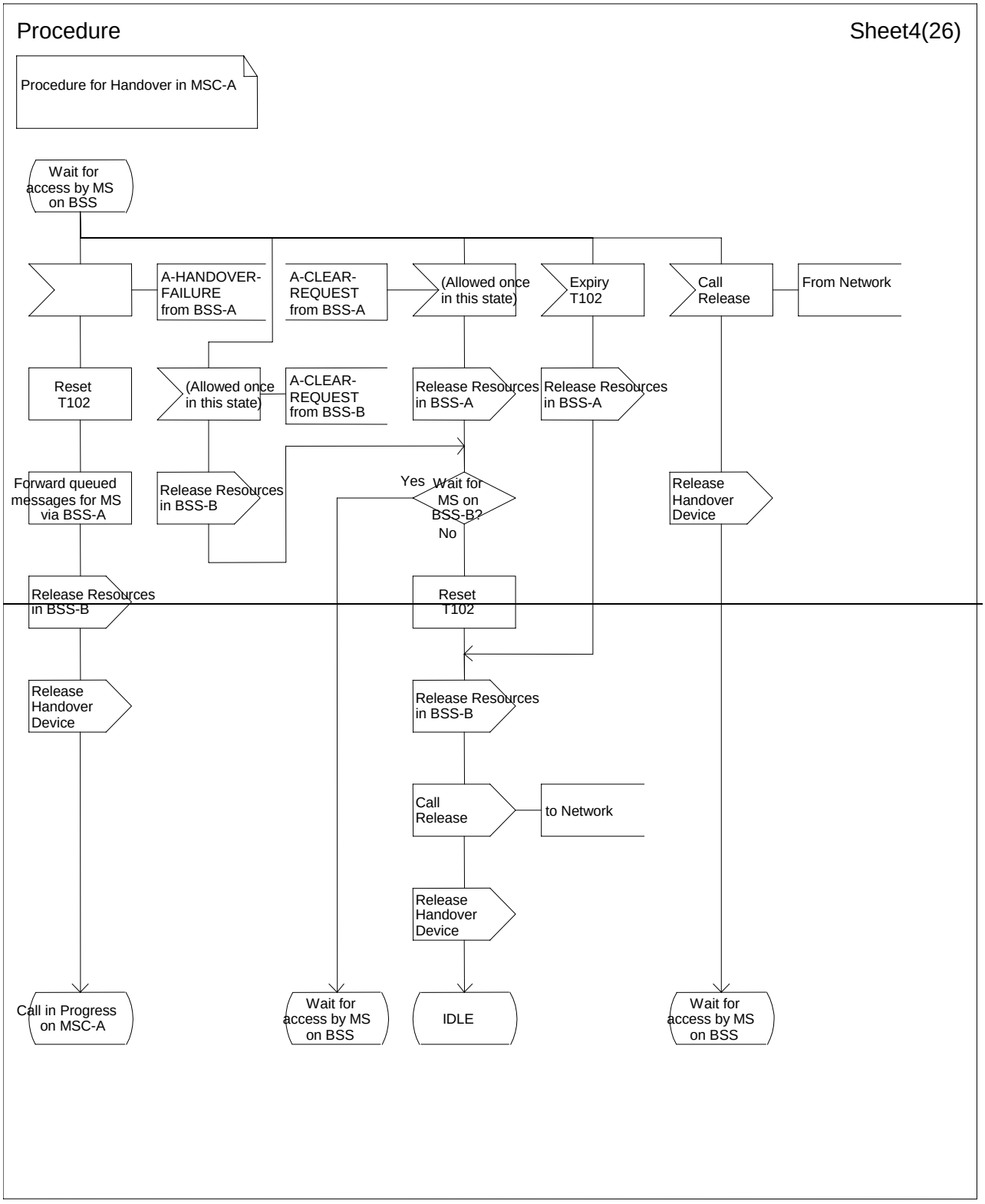
Other comments: ⌘

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

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

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

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


Procedure
Sheet4(26)
Procedure for Handover in MSC-A
Wait for access by MS on BSS
A-HANDOVER-FAILURE from BSS-A
A-CLEAR-REQUEST from BSS-A
(Allowed once in this state)
Expiry T102
Call Release
From Network
Reset T102
(Allowed once in this state)
A-CLEAR-REQUEST from BSS-B
Release Resources in BSS-A
Release Resources in BSS-A
Forward queued messages for MS via BSS-A
Release Resources in BSS-B
Yes
Wait for MS on BSS-B?
No
Release Handover Device
Release Resources in BSS-B
Reset T102
Release Handover Device
Release Resources in BSS-B
Call Release
to Network
Release Handover Device
Call in Progress on MSC-A
Wait for access by MS on BSS
IDLE
Wait for access by MS on BSS

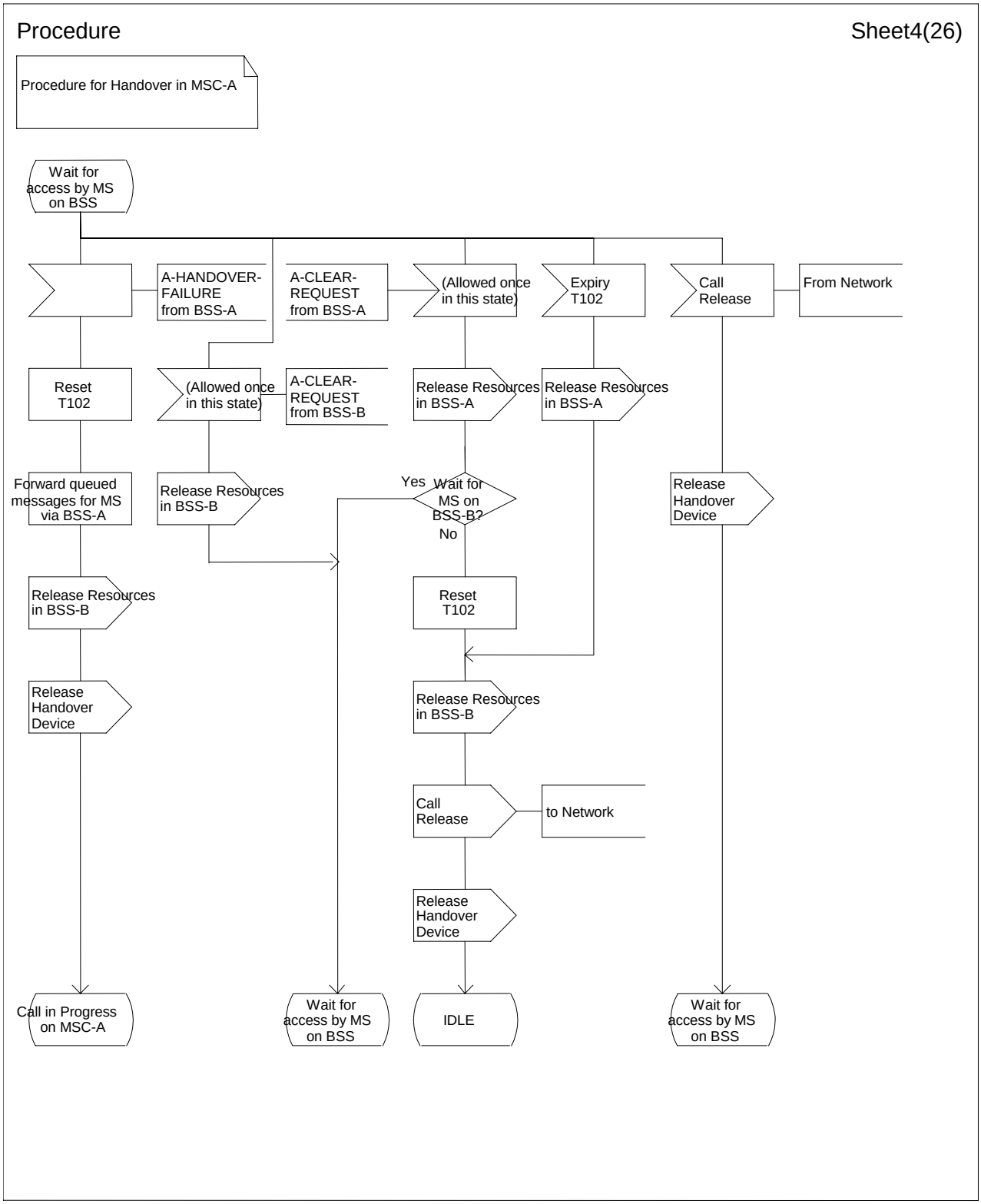


Figure 41 (Sheet 4 of 26): Handover control procedure in MSC-A

3GPP TSG-CN1 Meeting #27 ***Tdoc N1-022271***
Bangkok, Thailand, 11 – 15 November 2002

CR-Form-v7

CHANGE REQUEST

⌘ **23.009** **CR** **082** ⌘ **rev** **2** ⌘ Current version: **4.5.0** ⌘

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

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	MSC_A_HO SDL correction
Source:	⌘	Nortel Networks
Work item code:	⌘	TEI
Date:	⌘	Oct. 31, 2002
Category:	⌘	**A**
Release:	⌘	Rel-4

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

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
Rel-4 (Release 4)
Rel-5 (Release 5)
Rel-6 (Release 6)

Reason for change:	⌘	In GSM 03.09 v7.0.0, the SDL diagram for "Procedure MSC_A_HO Sheet4(26)" shows that when a Clear Request from BSS-b is received, the MSC releases resources on BSS-b and transitions to the "Wait for Access by MS on BSS" state. The MSC waits until the T102 timer expires and connection reverts back to BSS-A. However in 23.009, the same SDL diagram shows that when a Clear Request from BSS-b is received, the MSC release resources on BSS-b, then MSC enters the "decision box" of "Wait for MS on BSS-b". The missing MSC_A_HO and MSC_B_HO SDLs from 03.09 were included in 23.009 v3.2.0 (v3.2.1 was editorial). There is no evidence of an approved CR that makes this change between 03.09 v7.0.0 and 23.009 v3.2.0. The SDL in 23.009 is incorrect and must be changed back to what is in 03.09.
Summary of change:	⌘	Correct the SDL for "Procedure MSC_A_HO Sheet4(26)"
Consequences if not approved:	⌘	Inconsistent with SDL from previous releases.

Clauses affected:	⌘	15 (Figure 41)

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

Other comments: ⌘

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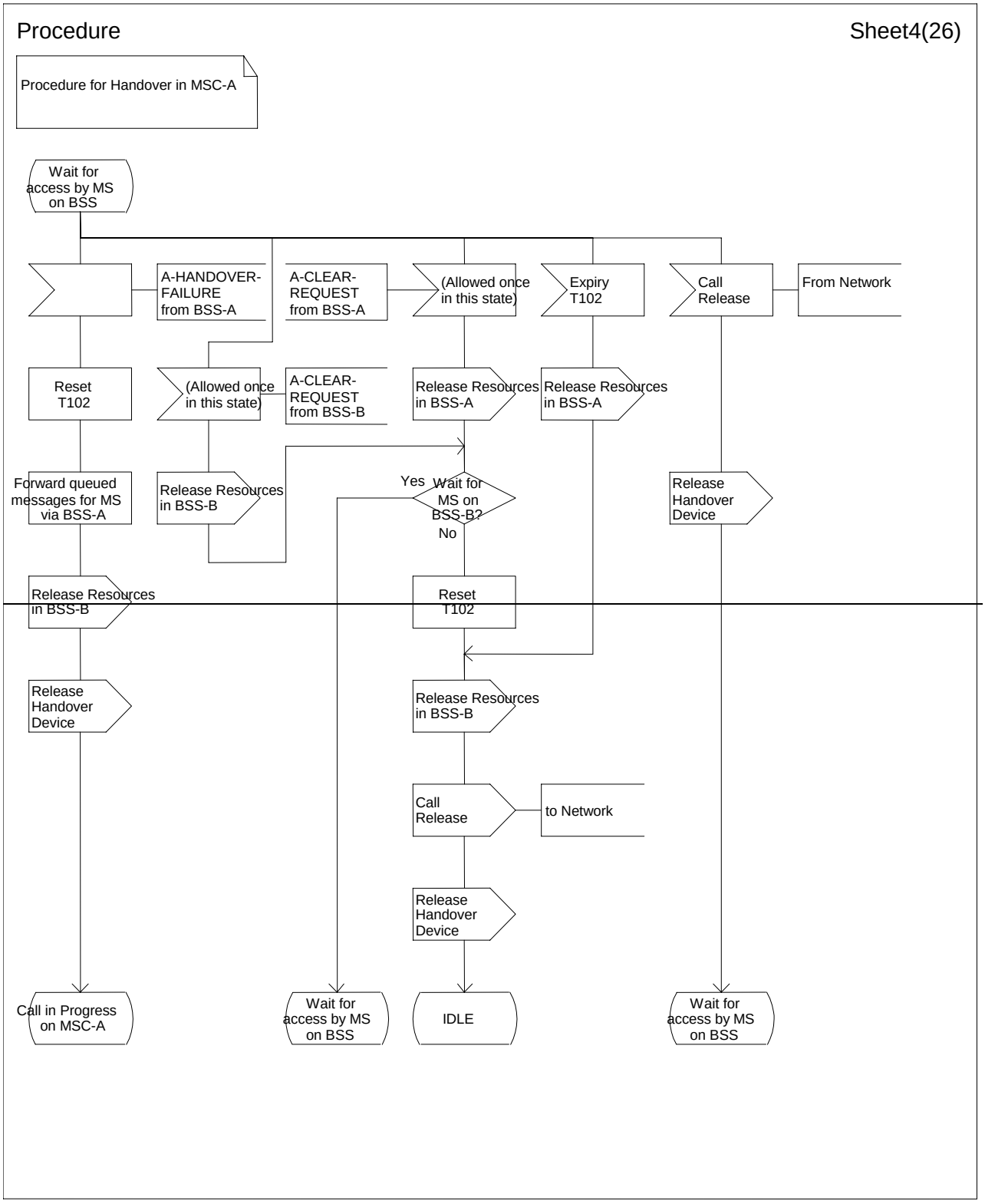
3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.


Procedure
Sheet4(26)
Procedure for Handover in MSC-A
Wait for access by MS on BSS
A-HANDOVER-FAILURE from BSS-A
A-CLEAR-REQUEST from BSS-A
(Allowed once in this state)
Expiry T102
Call Release
From Network
Reset T102
(Allowed once in this state)
A-CLEAR-REQUEST from BSS-B
Release Resources in BSS-A
Release Resources in BSS-A
Forward queued messages for MS via BSS-A
Release Resources in BSS-B
Yes
Wait for MS on BSS-B?
No
Release Handover Device
Release Resources in BSS-B
Reset T102
Release Handover Device
Release Resources in BSS-B
Call Release
to Network
Release Handover Device
Call in Progress on MSC-A
Wait for access by MS on BSS
IDLE
Wait for access by MS on BSS

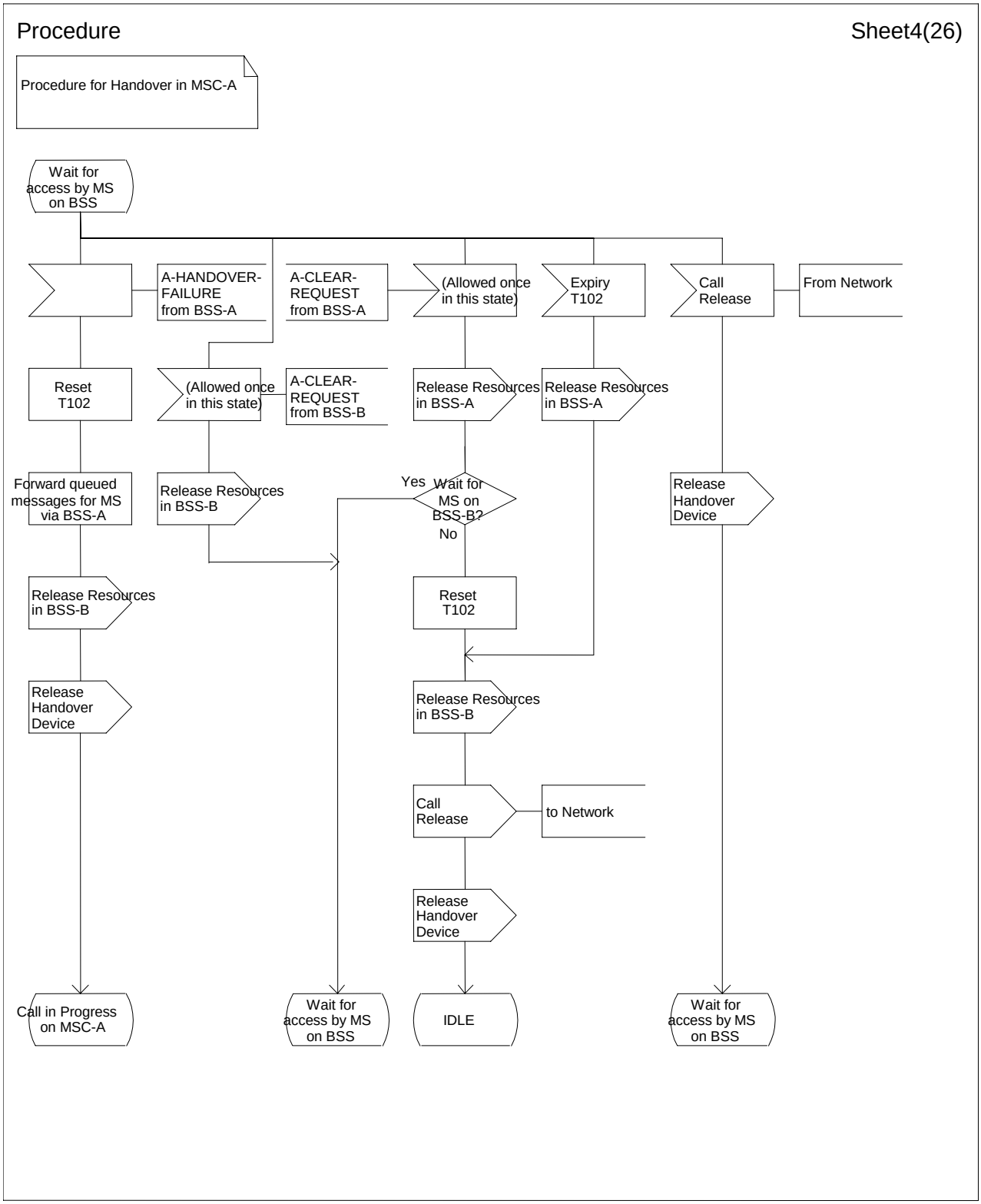


Figure 41 (Sheet 4 of 26): Handover control procedure in MSC-A

3GPP TSG-CN1 Meeting #27 ***Tdoc N1-022272***
Bangkok, Thailand, 11 – 15 November 2002

CR-Form-v7

CHANGE REQUEST

⌘ **23.009** **CR** **083** ⌘ **rev** **2** ⌘ Current version: **5.2.0** ⌘

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

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	MSC_A_HO SDL correction
Source:	⌘	Nortel Networks
Work item code:	⌘	TEI
Date:	⌘	Oct. 31, 2002
Category:	⌘	**A**
Release:	⌘	Rel-5

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

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
Rel-4 (Release 4)
Rel-5 (Release 5)
Rel-6 (Release 6)

Reason for change: ⌘

In GSM 03.09 v7.0.0, the SDL diagram for “Procedure MSC_A_HO Sheet4(26)” shows that when a Clear Request from BSS-b is received, the MSC releases resources on BSS-b and transitions to the "Wait for Access by MS on BSS" state. The MSC waits until the T102 timer expires and connection reverts back to BSS-A.

However in 23.009, the same SDL diagram shows that when a Clear Request from BSS-b is received, the MSC release resources on BSS-b, then MSC enters the "decision box" of "Wait for MS on BSS-b".

The missing MSC_A_HO and MSC_B_HO SDLs from 03.09 were included in 23.009 v3.2.0 (v3.2.1 was editorial).

There is no evidence of an approved CR that makes this change between 03.09 v7.0.0 and 23.009 v3.2.0.

The SDL in 23.009 is incorrect and must be changed back to what is in 03.09.

Summary of change: ⌘ Correct the SDL for “Procedure MSC_A_HO Sheet4(26)”

Consequences if not approved: ⌘ Inconsistent with SDL from previous releases.

Clauses affected: ⌘ 15 (Figure 41)

Other specs affected: ⌘

Y	N	
	X	Other core specifications
	X	Test specifications
	X	O&M Specifications

⌘

Other comments: ⌘

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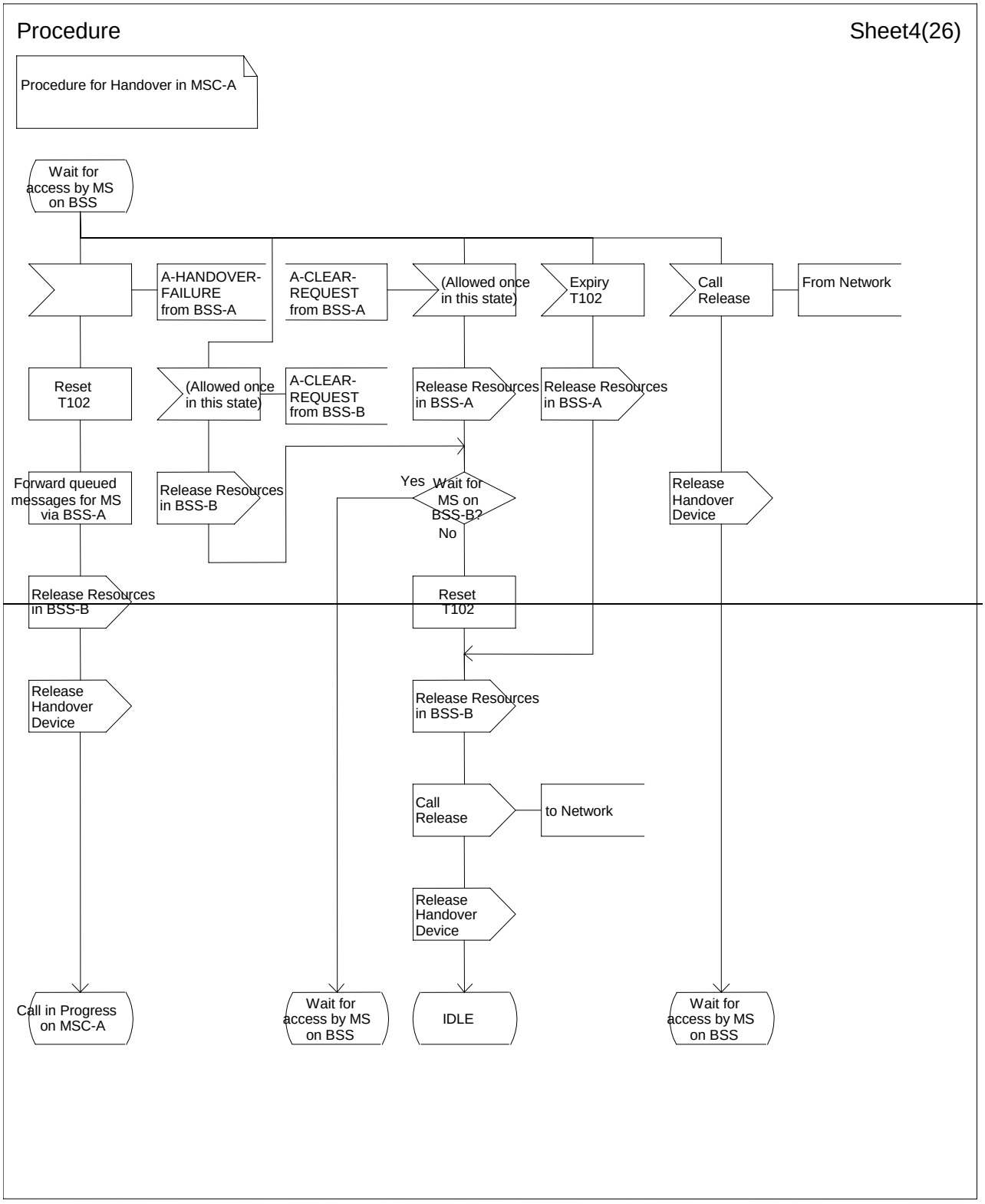
3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.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A-CLEAR-REQUEST from BSS-A
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(Allowed once in this state)
A-CLEAR-REQUEST from BSS-B
Release Resources in BSS-A
Release Resources in BSS-A
Forward queued messages for MS via BSS-A
Release Resources in BSS-B
Yes
Wait for MS on BSS-B?
No
Release Handover Device
Release Resources in BSS-B
Reset T102
Release Handover Device
Release Resources in BSS-B
Call Release
to Network
Release Handover Device
Call in Progress on MSC-A
Wait for access by MS on BSS
IDLE
Wait for access by MS on BSS

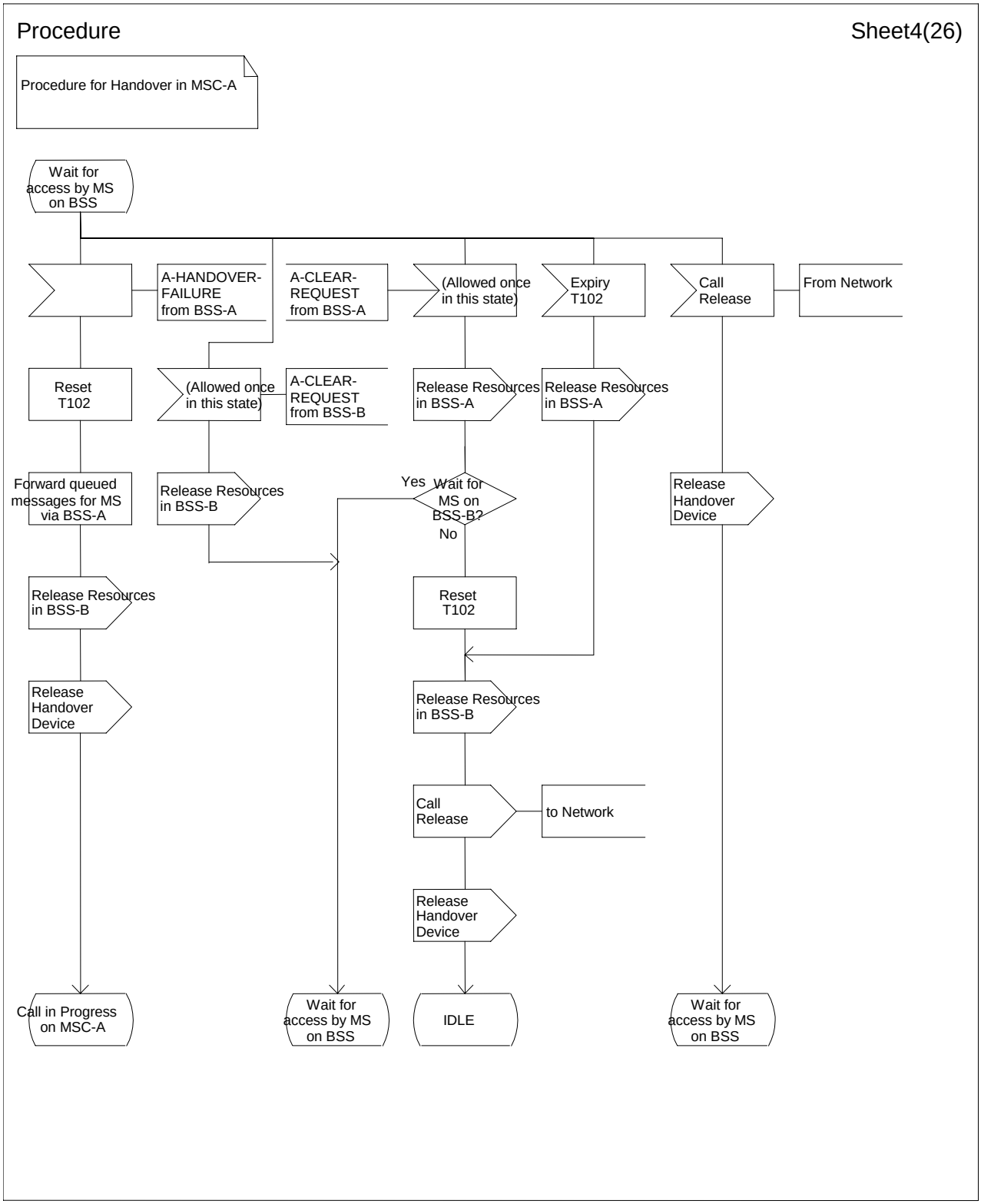

Figure 41 (Sheet 4 of 26): Handover control procedure in MSC-A

3GPP TSG-CN1 Meeting #27 ***Tdoc N1-022417***
Bangkok, Thailand, 11 – 15 November 2002 **Rev. of N1-022321**

CR-Form-v7

CHANGE REQUEST

⌘ **24.008** **CR** **719** ⌘ **rev** **1** ⌘ Current version: **3.13.0** ⌘

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

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

Title:	⌘	Correcting errors and making improvements to references
Source:	⌘	CN1 secretary
Work item code:	⌘	TEI
Date:	⌘	13/11/2002
Category:	⌘	**F**
Release:	⌘	R99

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

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	Misleading references and missing or non-existing references are corrected.
Summary of change:	⌘	01.02 is a non-existing specification and is deleted. Used only 3GPP TR 21.905 as vocabulary reference. 02.07 was split into 22.001 and 22.101. It was not referenced and this version only needs to refer 22.101. 02.40 was not continued after R98 but moved to 22.001. 24.071 and 24.108 is referenced but never existed, => 04.71 and 24.008. 04.64 has [76] as reference which is wrong pointer, but is introduced as [78a]. 03.01, 03.38, 03.93 becomes respectively 23.101, 23.038 and 23.093. The following were introduced in chapter 2 since they are refered to in the specification: 22.101, 23.038, 23.093, 23.108, 25.321, 25.322, 25.304, 25.413, 33.102, 04.64, 04.56, 08.08, 08.18, 22.042 and 23.040. All GSM specifications are transferred to 3GPP TS documents and / or the specification numbers are aligned with the ones valid for R99. A lot of editorials do the final cleanup. Revised due to deleting ref.[9] (3GPP TS 03.01) in 5.2.1.10 since the feature is not carried on to 23.101. In 4.5.1.5 the last line that was deleted text is now merged to the NOTE, and 10.5.4.5 has seperated the notes as in later releases.
Consequences if not approved:	⌘	Wrong guidance given and so confusing the readers.

Clauses affected:	⌘	1, 2, 3, 4.5.1.5, 4.5.1.6.1, 4.7.1.7, 4.7.5.2.3, 4.7.6.3, 4.7.7.2, 4.7.7.3, 4.7.7.8, 5.2.1.10, 5.2.2.3.3, 6.1.2, 7, 8.1, 8.8, 9.3.23, 10.1, 10.5.1.6, 10.5.1.7, 10.5.3.5a, 10.5.4.15, 10.5.4.24, 10.5.4.26, 10.5.5.12, 10.5.5.12a, 11.3, Annex C.2.1 and several other clauses for small corrections.

		Y	N			
Other specs affected:	⌘		X	Other core specifications	⌘	
			X	Test specifications		
			X	O&M Specifications		
Other comments:	⌘					

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://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

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

1 Scope

The present document specifies the procedures used at the radio interface core network protocols within the 3rd generation mobile telecommunications system and the digital cellular telecommunications system.

It specifies the procedures used at the radio interface (Reference Point Um or Uu, see 3GPP TS 24.002 or 3GPP TS 23.002) for Call Control (CC), Mobility Management (MM), and Session Management (SM).

When the notations for "further study" or "FS" or "FFS" are present in this TS they mean that the indicated text is not a normative portion of this standard.

These procedures are defined in terms of messages exchanged over the control channels of the radio interface. The control channels are described in ~~GSM~~3GPP TS 04.03 and 3GPP TS 25.301.

The structured functions and procedures of this protocol and the relationship with other layers and entities are described in general terms in 3GPP TS 24.007.

1.1 Scope of the Technical Specification

The procedures currently described in this TS are for the call control of circuit-switched connections, session management for GPRS services, mobility management and radio resource management for circuit-switched and GPRS services.

3GPP TS 24.011 contains functional procedures for support of supplementary services.

3GPP TS 24.012 contains functional procedures for support of point-to-point short message services.

~~GSM~~3GPP TS ~~04.12~~24.012 contains functional description of short message - cell broadcast.

~~GSM~~3GPP TS 04.60 contains procedures for radio link control and medium access control (RLC/MAC) of packet data physical channels.

3GPP TS 04.71 [23a]~~24.071~~ contains functional descriptions and procedures for support of location services.

NOTE: "layer 3" includes the functions and protocols described in the present document. The terms "data link layer" and "layer 2" are used interchangeably to refer to the layer immediately below layer 3.

1.2 Application to the interface structures

The procedures defined in the present document apply to the interface structures defined in ~~GSM~~3GPP TS 04.03 and 3GPP TS 25.301. They use the functions and services provided by lower layer defined in ~~GSM~~3GPP TS 04.05 and ~~GSM~~3GPP TS 04.06 or 3GPP TS 25.331, 3GPP TS 25.322 and 3GPP TS 25.321. 3GPP TS 24.007 gives the general description of layer 3 (A/Gb mode) and Non Access Stratum (Iu mode) including procedures, messages format and error handling.

1.4 Test procedures

Test procedures of the GSM radio interface signalling are described in ~~GSM~~3GPP TS 11.10 and ~~GSM~~3GPP TS 11.2x series.

1.5 Use of logical channels in A/Gb mode

The logical control channels are defined in ~~GSM~~3GPP TS 05.02. In the following those control channels are considered which carry signalling information or specific types of user packet information:

i) Broadcast Control CHannel (BCCH): downlink only, used to broadcast Cell specific information;

ii) Synchronization CHannel (SCH): downlink only, used to broadcast synchronization and BSS identification information;

iii) Paging CHannel (PCH): downlink only, used to send page requests to Mobile Stations (MSs);

iv) Random Access CHannel (RACH): uplink only, used to request a Dedicated Control CHannel;

v) Access Grant CHannel (AGCH): downlink only, used to allocate a Dedicated Control CHannel;

vi) Standalone Dedicated Control CHannel (SDCCH): bi-directional;

vii) Fast Associated Control CHannel (FACCH): bi-directional, associated with a Traffic CHannel;

viii) Slow Associated Control CHannel (SACCH): bi-directional, associated with a SDCCH or a Traffic CHannel;

ix) Cell Broadcast CHannel (CBCH): downlink only used for general (not point to point) short message information.

x) Notification CHannel (NCH): downlink only, used to notify mobile stations of VBS (Voice Broadcast Service) calls or VGCS (Voice Group Call Service) calls.

Two service access points are defined on signalling layer 2 which are discriminated by their Service Access Point Identifiers (SAPI) (see ~~GSM~~3GPP TS 04.06):

i) SAPI 0: supports the transfer of signalling information including user-user information;

ii) SAPI 3: supports the transfer of user short messages.

Layer 3 selects the service access point, the logical control channel and the mode of operation of layer 2 (acknowledged, unacknowledged or random access, see ~~GSM~~3GPP TS 04.05 and ~~GSM~~3GPP TS 04.06) as required for each individual message.

1.7.2.1 Packet services in GSM (GSM only)

For mobile stations supporting the General Packet Radio Service (GPRS), it is explicitly mentioned throughout the technical specification if a certain procedure is applicable only for such a service and, if necessary, how mobile stations not supporting such a service shall behave.

A GPRS MS may operate in one of the following MS operation modes, see 3GPP TS ~~03.60~~23.060 [74]:

- MS operation mode A;
- MS operation mode B; or
- MS operation mode C.

The MS operation mode depends on the services that the MS is attached to, i.e., only GPRS or both GPRS and non-GPRS services, and upon the MS's capabilities to operate GPRS and other GSM services simultaneously. Mobile stations that are capable to operate GPRS services are referred to as GPRS MSs.

NOTE: Other GSM technical specifications may refer to the MS operation modes A, B, and C as GPRS class-A MS, GPRS class-B MS, and GPRS class-C MS.

It should be noted that it is possible that for a GPRS MS, the GMM procedures currently described in the ETS do not support combinations of VGCS, VBS and GPRS. The possible interactions are not studied yet.

1.7.2.2 Packet services in UMTS (UMTS only)

An MS attached to packet switched domain may operate in one of the following MS operation modes, see 23.060 [74]:

- PS/CS mode of operation; or
- PS mode of operation.

The terms 'PS/CS mode of operation' and 'PS mode of operation' are not used in the present document with some exceptions. Instead the terms 'MS operation mode A' and 'MS operation mode C' are used.

In network operation mode I and II (see 23.060 [74]), an MS in PS/CS mode of operation shall use the same procedures as for a GPRS MS operating in MS operation mode A, unless it is explicitly stated for GSM only or UMTS only.

In network operation mode I and II, an MS in PS mode of operation shall use the same procedures as for a GPRS MS operating in MS operation mode C, unless it is explicitly stated for GSM only or UMTS only.

NOTE: Network operation mode III is not applicable for UMTS, see 3GPP TS 23.060 [74].

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] ~~3GPP TS 01.02: "Digital cellular telecommunications system (Phase 2+); General description of a GSM Public Land Mobile Network (PLMN)".~~ Void.

[2] 3GPP TR~~S~~ 01.04: "~~Digital cellular telecommunications system (Phase 2+);~~ Abbreviations and acronyms".

[2a] 3GPP TR~~S~~ 21.905 "~~3G~~ Vocabulary for 3GPP Specifications"

[3] 3GPP TS 22.002: "~~Digital cellular telecommunications system (Phase 2+);~~ Circuit Bearer Services (BS) supported by a ~~GSM~~ Public Land Mobile Network (PLMN)".

[4] 3GPP TS 22.003: "Teleservices supported by a ~~GSM~~ Public Land Mobile Network (PLMN)".

[5] 3GPP TS 02.09: "~~Digital cellular telecommunications system (Phase 2+);~~ Security aspects".

[5a] 3GPP TS 33.102: "3G security; Security architecture".

[6] 3GPP TS 22.011: "~~Digital cellular telecommunications system (Phase 2+);~~ Service accessibility".

[7] 3GPP TS 02.17: "~~Digital cellular telecommunications system (Phase 2+);~~ Subscriber I~~i~~dentity M~~m~~odules (SIM); ~~-~~Functional characteristics".

[8] 3GPP TS 22.101: "Service aspects; Service principles"~~3GPP TS 02.40: "Digital cellular telecommunications system (Phase 2+); Procedures for call progress indications"~~.

[8a] 3GPP TS 22.001: "Principles of circuit telecommunication services supported by a Public Land Mobile Network (PLMN)".

[8b] 3GPP TS 23.038: "Alphabets and language-specific information".

[9] 3GPP TS 23.101: "General UMTS Architecture".~~3GPP TS 03.01: "Digital cellular telecommunications system (Phase 2+); Network functions".~~

[9a] 3GPP TS 23.108: "Mobile radio interface layer 3 specification core network protocols; Stage 2 (structured procedures)".

[10] 3GPP TS 23.003: "~~Digital cellular telecommunications system (Phase 2+);~~ Numbering, addressing and identification".

[11] 3GPP TS 03.13: "~~Digital cellular telecommunications system (Phase 2+);~~ Discontinuous Reception (DRX) in the GSM system".

[12] 3GPP TS 23.014: "~~Digital cellular telecommunications system (Phase 2+); ~~Support of Dual Tone Multi-Frequency ~~signalling~~ (DTMF) signalling~~via the GSM system~~".

[12a] Void.

[13] 3GPP TS 03.20: "~~Digital cellular telecommunications system (Phase 2+); ~~Security~~ ~~-related network functions".

[14] 3GPP TS 23.122: " Non-Access-Stratum~~NAS~~ ~~F~~functions related to Mobile Station (MS) in idle mode".

[15] 3GPP TS 24.002: "GSM-UMTS Public Land Mobile Network (PLMN) access reference configuration".

[16] 3GPP TS 04.03: "~~Digital cellular telecommunications system (Phase 2+); ~~Mobile Station - Base Station System (MS - BSS) interface Channel structures and access capabilities".

[17] 3GPP TS 04.04: "~~Digital cellular telecommunications system (Phase 2+); ~~L~~l~~ayer 1~~;~~ ~~General requirements".

[18] 3GPP TS 04.05: "~~Digital cellular telecommunications system (Phase 2+); ~~Data Link (DL) layer~~;~~ General aspects".

[19] 3GPP TS 04.06: "~~Digital cellular telecommunications system (Phase 2+); ~~Mobile Station - Base Station System (MS - BSS) interface~~;~~ ~~-~~Data Link (DL) layer specification".

[19a] 3GPP TS 25.321: "Medium Access Control (MAC) protocol specification".

[19b] 3GPP TS 25.322: "Radio Link Control (RLC) protocol specification".

[19c] 3GPP TS 25.413: "UTRAN Iu interface RANAP signalling".

[20] 3GPP TS 24.007: "~~Digital cellular telecommunications system (Phase 2+); ~~Mobile radio interface signalling layer 3~~;~~ General aspects".

[21] 3GPP TS 24.010: "~~Digital cellular telecommunications system ; ~~Mobile radio interface layer 3~~;~~ Supplementary services specification~~;~~ ~~-~~ General aspects".

[22] 3GPP TS 24.011: "Point-to-Point (PP) Short Message Service (SMS) support on mobile radio interface".

[23] 3GPP TS 24.012: "Short Message Service Cell Broadcast (SMSCB) support on the mobile radio interface".

[23a] 3GPP TS ~~2~~04.~~0~~71: "Location Services (LCS); Mobile radio interface layer 3 specification~~Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 location services specification~~".

[23b] 3GPP TS 04.31 "~~Digital cellular telecommunication system (Phase 2+); ~~Location Services (LCS); Mobile Station (MS) ~~–~~ Serving Mobile Location Centre (SMLC); Radio Resource LCS Protocol (RRLP)".

[23c] 3GPP TS 25.331 : " Radio Resource Control (RRC) protocol specification ~~3rd Generation Partnership Project;Technical Specification Group Radio Access Network; RRC Protocol Specification~~"

[24] 3GPP TS 24.080: "~~Digital cellular telecommunications system (Phase 2+); ~~Mobile radio ~~interface~~ ~~l~~Layer 3 supplementary services specification~~;~~ ~~-~~ Formats and coding".

[25] 3GPP TS 24.081: "~~Digital cellular telecommunications system (Phase 2+); ~~Line identification supplementary services~~;~~ ~~–~~ Stage 3".

[26] 3GPP TS 24.082: "~~Digital cellular telecommunications system (Phase 2+); ~~Call Forwarding (CF) supplementary services~~;~~ ~~–~~ Stage 3".

[27] 3GPP TS 24.083: "~~Digital cellular telecommunications system (Phase 2+); ~~Call Waiting (CW) and Call Hold (HOLD) supplementary services~~;~~ ~~–~~ Stage 3".

[28] 3GPP TS 24.084: "~~Digital cellular telecommunications system (Phase 2+); ~~MultiParty (MPTY) supplementary services~~;~~ ~~–~~ Stage 3".

[29] 3GPP TS 24.085: "~~Digital cellular telecommunications system (Phase 2+); ~~Closed User Group (CUG) supplementary services~~;~~ ~~–~~ Stage 3".

[30] 3GPP TS 24.086: "~~Digital cellular telecommunications system (Phase 2+); ~~Advice of Charge (AoC) supplementary services~~;~~ ~~–~~ Stage 3".

[31] 3GPP TS 24.088: "Call Barring (CB) supplementary services~~;~~ ~~–~~ Stage 3".

[32] 3GPP TS 05.02: "~~Digital cellular telecommunications system (Phase 2+); ~~Multiplexing and multiple access on the radio path".

[33] 3GPP TS 05.05: "~~Digital cellular telecommunications system (Phase 2+); ~~Radio transmission and reception".

[34] 3GPP TS 05.08: "~~Digital cellular telecommunications system (Phase 2+); ~~Radio subsystem link control".

[35] 3GPP TS 05.10: "~~Digital cellular telecommunications system (Phase 2+); ~~Radio subsystem synchronization".

[36] 3GPP TS 27.001: "General on Terminal Adaptation Functions (TAF) for Mobile Stations (MS)".

[37] 3GPP TS 29.002: "~~Digital cellular telecommunications system (Phase 2+); ~~Mobile Application Part (MAP) specification".

[38] 3GPP TS 29.007: "~~Digital cellular telecommunications system (Phase 2+); ~~General requirements on interworking between the Public Land Mobile Network (PLMN) and the Integrated Services Digital Network (ISDN) or Public Switched Telephone Network (PSTN)".

[39] ~~GSM~~3GPP TS 11.10: "~~Digital cellular telecommunications system (Phase 2+); ~~Mobile Station (MS) conformity specification".

[40] ~~GSM~~3GPP TS 11.21: "~~Digital cellular telecommunications system (Phase 2); The GSM ~~Base Station System (BSS) equipment specification; Radio aspects ".

[41] ISO/IEC 646 (1991): "Information technology - ISO 7-bit coded character set for information interchange".

[42] ISO/IEC 6429: "Information technology - Control functions for coded character sets".

[43] ISO 8348 (1987): "Information processing systems - Data communications - Network service definition".

[44] ITU-T Recommendation E.163: "Numbering plan for the international telephone service".

[45] ITU-T Recommendation E.164: "Numbering plan for the ISDN era".

[46] ITU-T Recommendation E.212: "Identification plan for land mobile stations".

[47] ITU-T Recommendation F.69 (1993): "Plan for telex destination codes".

[48] ITU-T Recommendation I.330: "ISDN numbering and addressing principles".

[49] ITU-T Recommendation I.440 (1989): "ISDN user-network interface data link layer - General aspects".

[50] ITU-T Recommendation I.450 (1989): "ISDN user-network interface layer 3 General aspects".

[51] ITU-T Recommendation I.500 (1993): "General structure of the ISDN interworking recommendations".

[52] ITU-T Recommendation T.50: "International Reference Alphabet (IRA) (Formerly International Alphabet No. 5 or IA5) - Information technology - 7-bit coded character set for information interchange~~International Alphabet No. 5~~".

[53] ITU Recommendation Q.931: ISDN user-network interface layer 3 specification for basic control".

[54] ITU-T Recommendation V.21: "300 bits per second duplex modem standardized for use in the general switched telephone network".

[55] ITU-T Recommendation V.22: "1200 bits per second duplex modem standardized for use in the general switched telephone network and on point-to-point 2-wire leased telephone-type circuits".

[56] ITU-T Recommendation V.22bis: "2400 bits per second duplex modem using the frequency division technique standardized for use on the general switched telephone network and on point-to-point 2-wire leased telephone-type circuits".

[57] ITU-T Recommendation V.23: "600/1200-baud modem standardized for use in the general switched telephone network".

[58] ITU-T Recommendation V.26ter: "2400 bits per second duplex modem using the echo cancellation technique standardized for use on the general switched telephone network and on point-to-point 2-wire leased telephone-type circuits".

[59] ITU-T Recommendation V.32: "A family of 2-wire, duplex modems operating at data signalling rates of up to 9600 bit/s for use on the general switched telephone network and on leased telephone-type circuits".

[60] ITU-T Recommendation V.110: "Support of data terminal equipments (DTEs) with V-Series interfaces by an integrated services digital network".

[61] ITU-T Recommendation V.120: "Support by an ISDN of data terminal equipment with V-Series type interfaces with provision for statistical multiplexing".

[62] ITU-T Recommendation X.21: "Interface between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) for synchronous operation on public data networks".

[63] ITU-T Recommendation X.25: "Interface between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit".

[64] ITU-T Recommendation X.28: "DTE/DCE interface for a start-stop mode data terminal equipment accessing the packet assembly/disassembly facility (PAD) in a public data network situated in the same country".

[65] ITU-T Recommendation X.30: "Support of X.21, X.21 bis and X.20 bis based data terminal equipments (DTEs) by an integrated services digital network (ISDN)".

[66] ITU-T Recommendation X.31: "Support of packet mode terminal equipment by an ISDN".

[67] ITU-T Recommendation X.32: "Interface between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) for terminals operating in the packet mode and accessing a packet switched public data network through a public switched telephone network or an integrated services digital network or a circuit switched public data network".

[68] ITU-T Recommendation X.75 (1988): "Packet-switched signalling system between public networks providing data transmission services".

[69] ITU-T Recommendation X.121: "International numbering plan for public data networks".

[70] ETS 300 102-1: "Integrated Services Digital Network (ISDN); User-network interface layer 3; Specifications for basic call control".

[71] ETS 300 102-2: "Integrated Services Digital Network (ISDN); User-network interface layer 3; Specifications for basic call control; Specification Description Language (SDL) diagrams ".

[72] ISO/IEC10646: "Universal Multiple-Octet Coded Character Set (UCS)"; UCS2, 16 bit coding.

[73] 3GPP TS 22.060: "General Packet Radio Service (GPRS); Service Description; Stage 1".

[74] 3GPP TS 23.060: "General Packet Radio Service (GPRS); Service Description; Stage 2".

[75] 3GPP TS 03.64: "~~Digital cellular telecommunications system (Phase 2+);~~ General Packet Radio Service (GPRS); Overall description of the GPRS radio interface; Stage 2".

[76] 3GPP TS 04.60: "~~Digital cellular telecommunications system (Phase 2+);~~ General Packet Radio Service (GPRS); Mobile Station (MS) - Base Station System (~~MS~~ BSS) interface; Radio Link Control/ ~~and~~ Medium Access Control (RLC/MAC) protocol~~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); Mobile Station (MS) - Serving GPRS Support Node (SGSN); Subnetwork Dependent Convergence Protocol (SNDCP)".

[78a] 3GPP TS 04.64: "Mobile Station - Serving GPRS Support Node (MS-SGSN) Logical Link Control (LLC) Layer Specification".

[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: "~~3rd Generation Partnership Project; Technical Specification Group Services and System Aspects;~~ Quality of Service (QoS) ~~C~~concept and ~~A~~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".

[82a] 3GPP TS 25.304: "UE Procedures in Idle Mode and Procedures for Cell Reselection in Connected Mode".

[83] 3GPP TS 04.18: "Mobile radio interface layer 3 specification, Radio Resource Control Protocol".

[84] 3GPP TS 03.55: "Dual Transfer Mode (DTM); Stage 2".

[85] 3GPP TS 23.067: "enhanced Multi-Level Precedence and Pre-emption service (eMLPP); ~~–~~ Stage 2".

[85a] 3GPP TS 23.093: "Technical realization of Completion of Calls to Busy Subscriber (CCBS); Stage 2".

[86] 3GPP TS 26.103: "~~3rd Generation Partnership Project; TSG SA Codec Working Group;~~ Speech Codec List for GSM and UMTS"

[87] 3GPP TS 08.08: "Mobile-services Switching Centre – Base Station System (MSC – BSS) interface; layer 3 specification".

[88] 3GPP TS 08.18: "General Packet Radio Service (GPRS); Base Station System (BSS) - Serving GPRS Support Node (SGSN); BSS GPRS Protocol (BSSGP)".

[89] 3GPP TS 22.042: "Network Identity and Time Zone (NITZ), Stage 1".

[90] 3GPP TS 23.040: "Technical realization of Short Message Service (SMS)".

[91] 3GPP TS 04.56: "GSM Cordless Telephony System (CTS), (Phase 1) CTS Radio Interface Layer 3 Specification".

2.1 Definitions and abbreviations

Abbreviations used in the present document are listed in ~~GSM~~3GPP TR ~~0~~21.905~~4~~.

2.2.2 Vocabulary

The following terms are used in the present document:

- A **GSM security context** is established and stored in the MS and the network as a result of a successful execution of a GSM authentication challenge. The GSM security context consists of the GSM ciphering key and the ciphering key sequence number.

- A **UMTS security context** is established and stored in the MS and the network as a result of a successful execution of a UMTS authentication challenge. The UMTS security context consists of the UMTS ciphering key, the UMTS integrity key, the GSM ciphering key and the cipher key sequence number.

- **idle mode:** In this mode, the mobile station is not allocated any dedicated channel; it listens to the CCCH and the BCCH;

- **group receive mode:** (only applicable for mobile stations supporting VGCS listening or VBS listening) In this mode, the mobile station is not allocated a dedicated channel with the network; it listens to the downlink of a voice broadcast channel or voice group call channel allocated to the cell. Occasionally, the mobile station has to listen to the BCCH of the serving cell as defined in 3GPP TS's 03.22 and 05.08;

- **dedicated mode:** In this mode, the mobile station is allocated at least two dedicated channels, only one of them being a SACCH;

- **group transmit mode:** (only applicable for mobile stations supporting VGCS talking) In this mode, one mobile station of a voice group call is allocated two dedicated channels, one of them being a SACCH. These channels can be allocated to one mobile station at a time but to different mobile stations during the voice group call;

- **packet idle mode**: (only applicable for mobile stations supporting GPRS) In this mode, mobile station is not allocated any radio resource on a packet data physical channel; it listens to the PBCCH and PCCCH or, if those are not provided by the network, to the BCCH and the CCCH, see ~~GSM~~3GPP TS 04.60;

- **packet transfer mode**: (only applicable for mobile stations supporting GPRS) In this mode, the mobile station is allocated radio resource on one or more packet data physical channels for the transfer of LLC PDUs.

- **main DCCH:** In Dedicated mode and group transmit mode, only two channels are used as DCCH, one being a SACCH, the other being a SDCCH or a FACCH; the SDCCH or FACCH is called here "the main DCCH";

- A channel is **activated** if it can be used for transmission, in particular for signalling, at least with UI frames. On the SACCH, whenever activated, it must be ensured that a contiguous stream of layer 2 frames is sent;

- A TCH is **connected** if circuit mode user data can be transferred. A TCH cannot be connected if it is not activated. A TCH which is activated but not connected is used only for signalling, i.e. as a DCCH;

- The data link of SAPI 0 on the main DCCH is called the **main signalling link**. Any message specified to be sent on the main signalling link is sent in acknowledged mode except when otherwise specified;

- The term **"to establish"** a link is a short form for **"to establish the multiframe mode"** on that data link. It is possible to send UI frames on a data link even if it is not established as soon as the corresponding channel is activated. Except when otherwise indicated, a data link layer establishment is done without an information field;

- **"channel set"** is used to identify TCHs that carry related user information flows, e.g., in a multislot configuration used to support circuit switched connection(s), which therefore need to be handled together;

- A **temporary block flow** (TBF) is a physical connection used by the two RR peer entities to support the uni-directional transfer of LLC PDUs on packet data physical channels, see ~~GSM~~3GPP TS 04.60;

- **RLC/MAC block:** A RLC/MAC block is the protocol data unit exchanged between RLC/MAC entities, see ~~GSM~~3GPP TS 04.60;

- A **GMM context** is established when a GPRS attach procedure is successfully completed;

- **Network operation mode**

  The three different network operation modes I, II, and III are defined in 3GPP TS 23.060 [74].

The network operation mode shall be indicated as system information. For proper operation, the network operation mode should be the same in each cell of one routing area.

- **GPRS MS operation mode**

  The three different GPRS MS operation modes A, B, and C are defined in 3GPP TS 23.060 [74].

- **RR connection:** A RR connection is a dedicated physical circuit switched domain connection used by the two RR or RRC peer entities to support the upper layers' exchange of information flows.

- **PS signalling connection** is a peer to peer UMTS connection between MS and CN packet domain node.

- **Inter-System change** is a change of radio access between different radio access technologies such as GSM and UMTS.

- **GPRS:** Packet Services for GSM and UMTS system.

- The label **(GSM only)** indicates this clause or paragraph applies only to GSM system. For multi system case this is determined by the current serving radio access network.

- The label **(UMTS only)** indicates this clause or paragraph applies only to UMTS system. For multi system case this is determined by the current serving radio access network.

- **In GSM,...** Indicates this paragraph applies only to GSM System. For multi system case this is determined by the current serving radio access network.

- **In UMTS,...** Indicates this paragraph applies only to UMTS System. For multi system case this is determined by the current serving radio access network.

- **SIM,** Subscriber Identity Module (see 3GPP TS 02.17). The present document makes no distinction between SIM and USIM.

- **MS,** Mobile Station. The present document makes no distinction between MS and UE.

- **Cell Notification** is an (optimised) variant of the Cell Update Procedure which uses the LLC NULL frame for cell change notification which does not trigger the restart of the READY timer

- **DTM,** dual transfer mode, see 3GPP TS 04.18[83] and 3GPP TS 03.55 [84].

3 Radio Resource management procedures

See ~~GSM~~3GPP TS 04.18.

4.1 General

This clause describes the procedures used for mobility management for non-GPRS services and for GPRS-services at the radio interface (Reference Point Um and Uu).

The main function of the Mobility Management sublayer is to support the mobility of user terminals, such as informing the network of its present location and providing user identity confidentiality.

A further function of the MM sublayer is to provide connection management services to the different entities of the upper Connection Management (CM) sublayer (see 3GPP TS 24.007).

There are two sets of procedures defined in this chapter:

- MM procedures for non-GPRS services (performed by the MM entity of the MM sublayer); and

- GMM procedures for GPRS services (performed by the GMM entity of the MM sublayer), see 3GPP TS 24.007 [20].

All the MM procedures described in this clause can only be performed if a RR connection has been established between the MS and the network. Else, the MM sublayer has to initiate the establishment of a RR connection (see ~~GSM~~3GPP TS 04.18 clause 3.3 and 3GPP TS 25.331).

In A/Gb mode, the GMM procedures described in this clause, use services provided by the RR sublayer without prior RR connection establishment.

In Iu mode: all the GMM procedures described in this clause can only be performed if a PS signalling connection has been established between the MS and the network. Else, the GMM sublayer has to initiate the establishment of a PS signalling connection (see 3GPP TS 25.331).

GMM procedures are mandatory and applicable only for GPRS MSs and networks supporting those MSs. For GPRS MSs which are IMSI attached for both GPRS and non-GPRS services, some MM procedures are replaced by GMM combined procedures provided that the network operates in network operation mode I, i.e. is supporting combined GMM procedures. GMM combined procedures are not applicable for the GPRS MS operation mode C but are mandatory for the GPRS MS operation modes A and B and networks supporting network operation mode I, see 3GPP TS 23.060.

4.2.2.4 Service State, NO IMSI

When in state MM IDLE and service state NO IMSI the mobile station shall (see clause 3.2, 3GPP TS 03.22 and ~~GSM~~3GPP TS 05.08):

- not start any normal location updating attempt;
- not perform periodic updating;
- not perform IMSI detach if powered down;
- reject any request from CM entities for MM connections except for emergency calls;
- not respond to paging;
- only perform default cell selection.

In addition, mobile stations supporting VGCS listening or VBS listening shall:

- not indicate notifications to the GCC or BCC layer.

4.3.1 TMSI reallocation procedure

The purpose of the TMSI reallocation procedure is to provide identity confidentiality , i.e. to protect a user against being identified and located by an intruder (see ~~GSM~~3GPP TS 02.09, 3GPP TS 03.20 and 3GPP TS 33.102).

If the identity confidentiality service is applied for an IMSI, a Temporary Mobile Subscriber Identity (TMSI) is used for identification within the radio interface signalling procedures.

The structure of the TMSI is specified in 3GPP TS 23.003. The TMSI has significance only within a location area. Outside the location area it has to be combined with the Location Area Identifier (LAI) to provide for an unambiguous identity.

Usually the TMSI reallocation is performed at least at each change of a location area. (Such choices are left to the network operator).

The reallocation of a TMSI can be performed either by a unique procedure defined in this clause or implicitly by a location updating procedure using the TMSI. The implicit reallocation of a TMSI is described together with that procedure.

If a TMSI provided by a mobile station is unknown in the network e.g. due to a data base failure, the network may require the mobile station to provide its International Mobile Subscriber Identity (IMSI). In this case the identification procedure (see clause 4.3.3) should be used before the TMSI reallocation procedure may be initiated.

The TMSI reallocation can be initiated by the network at any time whilst a RR connection exists between the network and the mobile station.

NOTE 1: Usually the TMSI reallocation is performed in ciphered mode.

NOTE 2: Normally the TMSI reallocation will take place in conjunction with another procedure, e.g. at location updating or at call setup (see 3GPP TS 29.002).

4.3.1.1 TMSI reallocation initiation by the network

The network initiates the TMSI reallocation procedure by sending a TMSI REALLOCATION COMMAND message to the mobile station and starts the timer T3250.

The TMSI REALLOCATION COMMAND message contains a new combination of TMSI and LAI allocated by the network or a LAI and the IMSI if the used TMSI shall be deleted. Usually the TMSI-REALLOCATION COMMAND message is sent to the mobile station using a RR connection in ciphered mode (see ~~GSM~~3GPP TS 03.20 and 3GPP TS 33.102).

4.3.1.3 TMSI reallocation completion in the network.

Upon receipt of the TMSI REALLOCATION COMPLETE message, the network stops the timer T3250 and either considers the new TMSI as valid or, if an IMSI was sent to the mobile station, considers the old TMSI as deleted.

If the RR connection is no more needed, then the network will request the RR sublayer to release it (see ~~GSM~~3GPP TS 04.18 clause 3.5 and 3GPP TS 25.331).

4.3.2b Authentication Procedure used for a GSM authentication challenge

The purpose of the authentication procedure is twofold (see ~~GSM~~3GPP TS 03.20):

- First to permit the network to check whether the identity provided by the mobile station is acceptable or not;
- Second to provide parameters enabling the mobile station to calculate a new GSM ciphering key.

The cases where the authentication procedure should be used are defined in ~~GSM~~3GPP TS 02.09.

The authentication procedure is always initiated and controlled by the network. GSM authentication challenge shall be supported by a ME supporting GSM or UMTS radio access.

A GSM security context is established in the MS and the network when a GSM authentication challenge is performed in GSM or in UMTS. However, in UMTS an MS which supports the UMTS authentication algorithm shall not accept a GSM authentication challenge. After a successful GSM authentication, the GSM ciphering key and the ciphering key sequence number, are stored both in the network and the MS.

4.3.2.1 Authentication request by the network

The network initiates the authentication procedure by transferring an AUTHENTICATION REQUEST message across the radio interface and starts the timer T3260. The AUTHENTICATION REQUEST message contains the parameters necessary to calculate the response parameters (see ~~GSM~~3GPP TS 03.20 (in case of GSM authentication challenge) and 3GPP TS 33.102 (in case of an UMTS authentication challenge)). In a GSM authentication challenge, the AUTHENTICATION REQUEST message also contains the GSM ciphering key sequence number allocated to the key which may be computed from the given parameters. In a UMTS authentication challenge, the AUTHENTICATION REQUEST message also contains the ciphering key sequence number allocated to the key set of UMTS ciphering key, UMTS integrity key and GSM ciphering key which may be computed from the given parameters.

4.3.2.3 Authentication processing in the network

Upon receipt of the AUTHENTICATION RESPONSE message, the network stops the timer T3260 and checks the validity of the response (see ~~GSM~~3GPP TS 03.20 in case of a GSM authentication challenge respective 3GPP TS 33.102 in case of an UMTS authentication challenge).

Upon receipt of the AUTHENTICATION FAILURE message, the network stops the timer T3260. In Synch failure case, the core network may renegotiate with the HLR/AuC and provide the MS with new authentication parameters.

4.3.2.4 Ciphering key sequence number

The security parameters for authentication and ciphering are tied together in sets.In a GSM authentication challenge, from a challenge parameter RAND both the authentication response parameter SRES and the GSM ciphering key can be computed given the secret key associated to the IMSI. In a UMTS authentication challenge, from a challenge parameter RAND, the authentication response parameter RES and the UMTS ciphering key and the UMTS integrity key can be computed given the secret key associated to the IMSI. In addition, a GSM ciphering key can be computed from the UMTS ciphering key and the UMTS integrity key by means of an unkeyed conversion function.

In order to allow start of ciphering on a RR connection without authentication, the ciphering key sequence numbers are introduced. The ciphering key sequence number is managed by the network in the way that the AUTHENTICATION REQUEST message contains the ciphering key sequence number allocated to the GSM ciphering key (in case of a GSM authentication challenge) or the UMTS ciphering key and the UMTS integrity key (in case of a UMTS authentication challenge) which may be computed from the RAND parameter carried in that message.

The mobile station stores the ciphering key sequence number with the GSM ciphering key (in case of a GSM authentication challenge) and the UMTS ciphering key and the UMTS integrity key (in case of a UMTS authentication challenge) and indicates to the network in the first message (LOCATION UPDATING REQUEST, CM SERVICE REQUEST, PAGING RESPONSE, CM RE-ESTABLISHMENT REQUEST) which ciphering key sequence number the stored GSM ciphering key (in case of a GSM authentication challenge) or set of UMTS ciphering, UMTS integrity and derived GSM ciphering keys (in case of a UMTS authentication challenge) has.

When the deletion of the ciphering key sequence number is described this also means that the associated GSM ciphering key, the UMTS ciphering key and the UMTS integrity key shall be considered as invalid (i.e. the established GSM security context or the UMTS security context is no longer valid).

In GSM, the network may choose to start ciphering with the stored GSM ciphering key (under the restrictions given in ~~GSM~~3GPP TS 02.09) if the stored ciphering key sequence number and the one given from the mobile station are equal.

In UMTS, the network may choose to start ciphering and integrity with the stored UMTS ciphering key and UMTS integrity key (under the restrictions given in ~~GSM~~3GPP TS 02.09 and 3GPP TS 33.102) if the stored ciphering key sequence number and the one given from the mobile station are equal.

NOTE: In some specifications the term KSI (Key Set Identifier) might be used instead of the term ciphering key sequence number.

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 clause 3.5.of 3GPP TS 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 clause 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.

4.3.2.7 Handling of keys at intersystem change from UMTS to GSM

At intersystem change from UMTS to GSM, ciphering may be started (see ~~GSM~~3GPP TS 04.18) without any new authentication procedure. Deduction of the appropriate security key for ciphering in GSM, depends on the current GSM/UMTS security context stored in the MS and the network.

The ME shall handle the GSM ciphering key according to table 4.3.2.7.1.

4.3.2.7a Use of established security contexts

In GSM, in the case of an established GSM security context, the GSM ciphering key shall be loaded from the SIM and taken into use by the ME when any valid CIPHERING MODE COMMAND is received during an RR connection (the definition of a valid CIPHERING MODE COMMAND message is given in ~~GSM~~3GPP TS 04.18 clause 3.4.7.2).

In GSM, in the case of an established UMTS security context, the GSM ciphering key shall be loaded from the SIM and taken into use by the MS when a valid CIPHERING MODE COMMAND is received during an RR connection (the definition of a valid CIPHERING MODE COMMAND message is given in ~~GSM~~3GPP TS 04.18 clause 3.4.7.2). The network shall derive a GSM ciphering key from the UMTS ciphering key and the UMTS integrity key by using the conversion function named "c3" defined in 3GPP TS 33.102.

In UMTS, in the case of an established GSM security context, the ME shall derive a UMTS ciphering key and a UMTS integrity key from the GSM ciphering key by using the conversion functions named "c4" and "c5" defined in 3GPP TS 33.102. The GSM ciphering key shall be loaded from the SIM and the derived UMTS ciphering key and UMTS integrity key shall be taken into use by the MS when a valid SECURITY MODE COMMAND indicating CS domain is received during an RR connection (the definition of a valid SECURITY MODE COMMAND message is given in 3GPP TS 25.331). The network shall derive a UMTS ciphering key and a UMTS integrity key from the GSM ciphering key by using the conversion functions named "c4" and "c5" defined in 3GPP TS 33.102.

In UMTS, in the case of an established UMTS security context, the UMTS ciphering key and UMTS integrity key shall be loaded from the SIM and taken into use by the MS when a valid SECURITY MODE COMMAND indicating CS domain is received during a RR connection (the definition of a valid SECURITY MODE COMMAND message is given in 3GPP TS 25.331).

NOTE: In UMTS and GSM, during an ongoing, already ciphering and/or integrity protected RR connection, the network might initiate a new Authentication procedure in order to establish a new GSM/UMTS security context. The new keys are taken into use in the MS when a new valid SECURITY MODE COMMAND indicating CS domain in UMTS, or a new valid CIPHERING MODE COMMAND in GSM, is received during the RR connection.

4.3.4 IMSI detach procedure

The IMSI detach procedure may be invoked by a mobile station if the mobile station is deactivated or if the Subscriber Identity Module (see ~~GSM~~3GPP TS 02.17 and 31.102) is detached from the mobile station.

In GSM, a flag (ATT) broadcast in the L3-RR SYSTEM INFORMATION TYPE 3 message on the BCCH is used by the network to indicate whether the detach procedure is required. The value of the ATT flag to be taken into account shall be the one broadcast when the mobile station was in MM idle.

In UMTS, a flag (ATT) broadcast in the L3-RRC SYSTEM INFORMATION BLOCK 1 message on the BCCH is used by the network to indicate whether the detach procedure is required. The value of the ATT flag to be taken into account shall be the one broadcast when the mobile station was in MM idle.

The procedure causes the mobile station to be indicated as inactive in the network.

4.4.1 Location updating procedure

The location updating procedure is a general procedure which is used for the following purposes:

- normal location updating (described in this clause);
- periodic updating (see clause 4.4.2);
- IMSI attach (see clause 4.4.3).

The normal location updating procedure is used to update the registration of the actual Location Area of a mobile station in the network. The location updating type information element in the LOCATION UPDATING REQUEST message shall indicate normal location updating. The conditions under which the normal location updating procedure is used by a mobile station in the MM IDLE state are defined for each service state in clause 4.2.2.

Only applicable for mobile stations supporting VGCS listening or VBS listening: A mobile station in RR group receive mode is in the MM IDLE state, substate RECEIVING GROUP CALL (NORMAL SERVICE) or RECEIVING GROUP CALL (LIMITED SERVICE). To perform a location updating, the MS in RR group receive mode shall leave the group receive mode, establish an independent dedicated RR connection to perform the location updating as described above and return to the RR group receive mode afterwards.

The normal location updating procedure shall also be started if the network indicates that the mobile station is unknown in the VLR as a response to MM connection establishment request.

To limit the number of location updating attempts made, where location updating is unsuccessful, an attempt counter is used. The attempt counter is reset when a mobile station is switched on or a SIM card is inserted.

Upon successful location updating the mobile station sets the update status to UPDATED in the SIM, and stores the received Location Area Identification in the SIM. The attempt counter shall be reset.

The detailed handling of the attempt counter is described in 4.4.4.6 to 4.4.4.9.

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". These lists shall be erased when the MS is switched off or when the SIM is removed, and periodically (with period in the range 12 to 24 hours). The location area identification received on the BCCH that triggered the location updating request shall be added to the suitable list whenever a location update reject message is received with the cause "Roaming not allowed in this location area" or with the cause "Location Area not allowed". The lists shall accommodate each 10 or more location area identifications. When the list is full and a new entry has to be inserted, the oldest entry shall be deleted.

The Mobile Equipment shall store a list of "equivalent PLMNs". This list is replaced or deleted at the end of each location update procedure, routing area update procedure and GPRS attach procedure. The stored list consists of a list of equivalent PLMNs as downloaded by the network plus the PLMN code of the network that downloaded the list. The stored list shall not be deleted when the MS is switched off. The stored list shall be deleted if the SIM is removed. The maximum number of possible entries in the stored list is six.

The cell selection processes in the different states are described in 3GPP TS 03.22 and ~~GSM~~3GPP TS 05.08.

The location updating procedure is always initiated by the mobile station.

4.4.2 Periodic updating

Periodic updating may be used to notify periodically the availability of the mobile station to the network. Periodic updating is performed by using the location updating procedure. The location updating type information element in the LOCATION UPDATING REQUEST message shall indicate periodic updating.

The procedure is controlled by the timer T3212 in the mobile station. If the timer is not already started, the timer is started each time the mobile station enters the MM IDLE substate NORMAL SERVICE or ATTEMPTing TO UPDATE. When the MS leaves the MM Idle State the timer T3212 shall continue running until explicitly stopped.

The timer is stopped (shall be set to its initial value for the next start) when:

- a LOCATION UPDATING ACCEPT or LOCATION UPDATING REJECT message is received;
- an AUTHENTICATION REJECT message is received;

- the first MM message is received, or security mode setting is completed in the case of MM connection establishment, except when the most recent service state is LIMITED SERVICE;

- the mobile station has responded to paging and thereafter has received the first correct layer 3 message except RR message;

- the mobile station is deactivated (i.e. equipment powered down or SIM removed).

When the timer T3212 expires, the location updating procedure is started and the timer shall be set to its initial value for the next start. If the mobile station is in other state than MM Idle when the timer expires the location updating procedure is delayed until the MM Idle State is entered.

The conditions under which the periodic location updating procedure is used by a mobile station in the MM IDLE state are defined for each service state in clause 4.2.2.

If the mobile station is in service state NO CELL AVAILABLE, LIMITED SERVICE, PLMN SEARCH or PLMN SEARCH-NORMAL SERVICE when the timer expires the location updating procedure is delayed until this service state is left.

In GSM, the (periodic) location updating procedure is not started if the BCCH information at the time the procedure is triggered indicates that periodic location shall not be used. The timeout value is broadcasted in the L3-RR SYSTEM INFORMATION TYPE 3 message on the BCCH, in the Control channel description IE, see ~~GSM~~3GPP TS 04.18 clause 10.5.2.11.

In UMTS, the (periodic) location updating procedure is not started if the information on BCCH or in the last received dedicated system information at the time the procedure is triggered indicates that periodic location shall not be used. The timeout value is broadcasted in the L3-RRC SYSTEM INFORMATION BLOCK 1 message on the BCCH, see 3GPP TS 25.331.

The T3212 timeout value shall not be changed in the NO CELL AVAILABLE, LIMITED SERVICE, PLMN SEARCH and PLMN SEARCH-NORMAL SERVICE states.

When a change of the T3212 timeout value has to be taken into account and the timer is running (at change of the serving cell or, change of the broadcast value of T3212), the MS shall behave as follows:

> Let t1 be the new T3212 timeout value and let t be the current timer value at the moment of the change to the new T3212 timeout value; then the timer shall be restarted with the value t modulo t1.

When the mobile station is activated, or when a change of the T3212 timeout value has to be taken into account and the timer is not running, the mobile station shall behave as follows:

> Let t1 be the new T3212 timeout value, the new timer shall be started at a value randomly, uniformly drawn between 0 and t1.

4.4.4.3 Authentication by the network

The authentication procedure (see clause 4.3.2) may be initiated by the network upon receipt of the LOCATION UPDATING REQUEST message from the mobile station. (See the cases defined in ~~GSM~~3GPP TS 02.09).

4.4.4.8 Release of RR connection after location updating

When the Location updating procedure is finished (see clauses 4.4.4.6 and 4.4.4.7) the mobile station shall (except in the case where the mobile has a follow-on CM application request pending and has received the follow-on proceed indication, see 4.4.4.6) set timer T3240 and enter the state WAIT FOR NETWORK COMMAND, expecting the release of the RR connection. The network may decide to keep the RR connection for network initiated establishment of a MM connection, or to allow for mobile initiated MM connection establishment.

Any release of the RR connection shall be initiated by the network according to clause 3.5 in ~~GSM~~3GPP TS 04.18, and 3GPP TS 25.331. 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 shall return to state MM IDLE.

At transition to state MM IDLE, substates NORMAL SERVICE or RECEIVING GROUP CALL (NORMAL SERVICE) or ATTEMPTING TO UPDATE either timer T3212 or timer T3211 is started as described in clause 4.4.4.9.

4.4.4.9 Abnormal cases on the mobile station side

The different abnormal cases that can be identified are the following:

a) Access barred because of access class control

The location updating procedure is not started. The mobile station stays in the current serving cell and applies normal cell reselection process. The procedure is started as soon as possible and if still necessary (when the barred state is ended or because of a cell change)

b) The answer to random access is an IMMEDIATE ASSIGNMENT REJECT message (A/Gb mode only)

The location updating is not started. The mobile station stays in the chosen cell and applies normal cell selection process. The waiting timer T3122 is reset when a cell change occurs. The procedure is started as soon as possible after T3122 timeout if still necessary.

c) Random access failure (A/Gb mode only)

Timer T3213 is started. When it expires the procedure is attempted again if still necessary.

NOTE 1: As specified in ~~GSM~~3GPP TS 05.08, a cell reselection then takes place, with return to the cell inhibited for 5 seconds if there is at least one other suitable cell. Typically the selection process will take the mobile station back to the cell where the random access failed after 5 seconds.

If at the expiry of timer T3213 a new cell has not been selected due to the lack of valid information (see ~~GSM~~3GPP TS 05.08), the mobile station may as an option delay the repeated attempt for up to 8 seconds to allow cell re-selection to take place. In this case the procedure is attempted as soon as a new cell has been selected or the mobile station has concluded that no other cell can be selected.

If random access failure occurs for two successive random access attempts for location updating the mobile station proceeds as specified below.

d) RR connection failure

The procedure is aborted and the mobile station proceeds as specified below.

e) T3210 timeout

The procedure is aborted, the RR connection is aborted and the MS proceeds as specified below.

f) RR release before the normal end of procedure

The procedure is aborted and the mobile station proceeds as specified below.

g) Location updating reject, other causes than those treated in clause 4.4.4.7

The MS waits for release of the RR connection as specified in clause 4.4.4.8, and then proceeds as specified below.

h) RR connection establishment failure (Iu mode only)

The procedure is aborted and the mobile station proceeds as specified below.

NOTE 2: Case h) covers all cases when the signalling connection cannot be established, including random access failure and access reject. As the RRC protocol has error specific retransmission mechanisms (see 3GPP TS 25.331), there is no need to distinguish between the different error cases within MM.

In cases d) to h) above and for repeated failures as defined in c) above the mobile station proceeds as follows. Timer T3210 is stopped if still running. The RR Connection is aborted in case of timer T3210 timeout. The attempt counter is incremented. The next actions depend on the Location Area Identities (stored and received from the BCCH of the current serving cell) and the value of the attempt counter.

– the update status is UPDATED, and the stored LAI is equal to the one received on the BCCH from the current serving cell and the attempt counter is smaller than 4:

The mobile station shall keep the update status to UPDATED, the MM IDLE sub-state after the RR connection release is NORMAL SERVICE. The mobile station shall memorize the location updating type used in the

location updating procedure. It shall start timer T3211 when the RR connection is released. When timer T3211 expires the location updating procedure is triggered again with the memorized location updating type;

– either the update status is different from UPDATED, or the stored LAI is different from the one received on the BCCH from the current serving cell, or the attempt counter is greater or equal to 4:

The mobile station shall delete any LAI, TMSI, ciphering key sequence number stored in the SIM, and list of equivalent PLMNs, set the update status to NOT UPDATED and enter the MM IDLE sub-state ATTEMPTING TO UPDATE when the RR connection is released (See clause 4.2.2.2 for the subsequent actions). If the attempt counter is smaller than 4, the mobile station shall memorize that timer T3211 is to be started when the RR connection is released, otherwise it shall memorize that timer T3212 is to be started when the RR connection is released.

4.5 Connection management sublayer service provision

The concept of MM connection is introduced in this clause. This concept is mainly a descriptive tool: The establishment of an MM connection by the network can be local (i.e. it is achieved by the transmission of the first CM layer message and without the transmission of any MM layer messages) or can be achieved by the transmission of a CM SERVICE PROMPT message (eg. in the case of certain ring back services). The release of an MM connection by the network or by the mobile station is always local, i.e. these purposes can be achieved without sending any MM messages over the radio interface. (On the contrary, establishment of an MM connection by the mobile station requires the sending of MM messages over the radio interface. An exception is VGCS, where an MM connection will be established as result of an uplink access procedure (see clause 3.7.2.1.1in ~~GSM~~3GPP TS 04.18).)

The Mobility Management (MM) sublayer is providing connection management services to the different entities of the upper Connection management (CM) sublayer (see 3GPP TS 24.007). It offers to a CM entity the possibility to use an MM connection for the exchange of information with its peer entity. An MM connection is established and released on request from a CM entity. Different CM entities communicate with their peer entity using different MM connections. Several MM connections may be active at the same time.

An MM connection requires an RR connection. All simultaneous MM connections for a given mobile station use the same RR connection.

In the following clauses, the procedures for establishing, re-establishing, maintaining, and releasing an MM connection are described, usually separately for the mobile station and the network side.

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, RR CONNECTION RELEASE NOT ALLOWED or MM connection active but not in MM connection active (Group call).

  An exception from this general rule exists for emergency calls (see clause 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 clause 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, stops and resets timer T3241, 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 clause 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 clause 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 clause 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 clause 3.4.7 in ~~GSM~~3GPP TS 04.18).

In UMTS, the network decides also if the security mode control procedure shall be invoked (see 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 clause 4.1.1.1.1 shall always have precedence over this clause.

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 clause 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 clause 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 clause 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.

4.5.1.3.3 Paging response in UMTS (UMTS only)

The network may initiate the paging procedure for CS services when the MS is IMSI attached for CS services. To initiate the procedure, the MM entity requests the RR sublayer to initiate paging (see 3GPP TS 25.331 and 3GPP TS 25.413) for CS services.

At reception of a paging message, the RR sublayer in the MS shall deliver a paging indication to the MM sublayer if the paging was initiated by the MM entity in the network (see 3GPP TS 25.331). The MS shall respond with the PAGING RESPONSE message defined in ~~GSM~~3GPP TS 04.18, clause 9.1.25. For reasons of backward compatibility the paging response shall use the RR protocol discriminator.

If the MS receives a paging request for CS services during an ongoing MM procedure, and the MS has already requested the establishment of a radio connection, the MS shall ignore the paging request and the MS and the network shall continue the MM procedure.

4.5.1.5 MM connection establishment for emergency calls

A MM connection for an emergency call may be established in all states of the mobility management sublayer which allow MM connection establishment for a normal originating call. In addition, establishment may be attempted in all service states where a cell is selected (see 4.2.2) but not in the MM CONNECTION ACTIVE state (GROUP TRANSMIT MODE) state. However, as a network dependent option, a MM connection establishment for emergency call may be rejected in some of the states.

When a user requests an emergency call establishment the mobile station will send a CM SERVICE REQUEST message to the network with a CM service type information element indicating emergency call establishment. If the network does not accept the emergency call request, e.g., because IMEI was used as identification and this capability is not supported by the network, the network will reject the request by returning a CM SERVICE REJECT message to the mobile station.

The reject cause information element indicates the reason for rejection. The following cause values may apply:

#3 "Illegal MS"

#4 "IMSI unknown in VLR"

#5 "IMEI not accepted"

#6 "Illegal ME"

#17 "Network failure"

#22 "Congestion"

#32 "Service option not supported"

#34 "Service option temporarily out of order"

With the above defined exceptions, the procedures described for MM connection establishment in 4.5.1.1 and 4.5.1.2 shall be followed.

NOTE 2: Normally, the mobile station will be identified by an IMSI or a TMSI. However, if none of these identifiers is available in the mobile station, then the mobile station shall use the IMEI for identification purposes. The network may in that case reject the request by returning a CM SERVICE REJECT message with reject cause:

#5 "IMEI not accepted".

4.5.1.6 Call re-establishment

The re-establishment procedure allows a MS to resume a connection in progress after a radio link failure, possibly in a new cell and possibly in a new location area. The conditions in which to attempt call re-establishment or not depend on the call control state, see clause 5.5.4 and, whether or not a cell allowing call re-establishment has been found (as described in ~~GSM~~3GPP TS 05.08). MM connections are identified by their protocol discriminators and transaction identifiers: these shall not be changed during call re-establishment.

The re-establishment takes place when a lower layer failure occurs and at least one MM connection is active (i.e.. the mobile station's MM sublayer is either in state 6 "MM CONNECTION ACTIVE" or state 20 "WAIT FOR ADDITIONAL OUTGOING MM CONNECTION").

NOTE: During a re-establishment attempt the mobile station does not return to the MM IDLE state; thus no location updating is performed even if the mobile is not updated in the location area of the selected cell.

No call re-establishment shall be performed for voice group and broadcast calls.

4.5.1.6.1 Call re-establishment, initiation by the mobile station

NOTE 1: 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 clause 10.5.1.4;
- mobile station classmark 2;
- ciphering key sequence number.

NOTE 2: Whether or not a CM entity can request re-establishment depends upon the Protocol Discriminator. The specifications for Short Message Service (~~GSM~~3GPP TS ~~04.11~~24.011), 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 clause 4.3.3) may be invoked.

The network may invoke the authentication procedure (see clause 4.3.2).

In GSM, the network decides if the security mode setting procedure shall be invoked (see 3GPP TS 04.18 clause 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 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 clause 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 clause 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 clause 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.

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~~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.

4.7.5 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~~3GPP TS 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 clause 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 clause 4.7.2.5.

The routing area updating procedure shall also be used by a MS which is attached for GPRS services if a new PLMN is entered (see 3GPP TS 23.122 [14]).

Clause 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 clause 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 clause 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 clause 4.4.1.

The Mobile Equipment shall contain a list of "equivalent PLMNs". The handling of this list is described in clause 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 clause "Service Request 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 04.65 [78] and 3GPP 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.

4.7.6 P-TMSI reallocation procedure

A temporary mobile station identity for GPRS services, the Packet-TMSI (P-TMSI), is used for identification within the radio interface signalling procedures. The structure of the P-TMSI is specified in 3GPP TS 23.003 [10]. The P-TMSI has significance only within a routing area. Outside the routing area it has to be combined with the routing area identification (RAI) to provide for an unambiguous identity.

The purpose of the P-TMSI reallocation procedure is to provide identity confidentiality, i.e. to protect a user against being identified and located by an intruder (see ~~GSM~~3GPP TS 02.09 [5] and 03.20 [34]).

Usually, P-TMSI reallocation is performed at least at each change of a routing area. (Such choices are left to the network operator).

The reallocation of a P-TMSI is performed by the unique procedure defined in this clause. This procedure can only be initiated by the network in state GMM-REGISTERED.

P-TMSI can also be implicitly reallocated in the attach or routing area updating procedures. The implicit reallocation of a P-TMSI is described in the corresponding clauses.

NOTE: Normally, the P-TMSI reallocation will take place in conjunction with another GMM procedure, e.g. at routing area updating (see 3GPP TS 29.002 [37]).

4.7.6.3 P-TMSI reallocation completion by the network

Upon receipt of the P-TMSI REALLOCATION COMPLETE message, the network stops the timer T3350 and considers both the old and the 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).

In GSM, the GMM layer shall notify the LLC layer that the P-TMSI has been changed (see ~~GSM~~3GPP TS 04.64 [7~~8a6~~]).

4.7.7a Authentication and ciphering procedure used for UMTS authentication challenge

The purpose of the authentication and ciphering procedure is fourfold (see 3GPP TS 33.102):

- to permit the network to check whether the identity provided by the MS is acceptable or not;
- to provide parameters enabling the MS to calculate a new GPRS UMTS ciphering key and a new GPRS UMTS integrity key.
- to let the network set the GSM ciphering mode (ciphering /no ciphering) and GSM ciphering algorithm; and
- to permit the mobile station to authenticate the network.

In UMTS, and in the case of a UMTS authentication challenge, the authentication and ciphering procedure can be used for authentication only.

The cases in which the authentication and ciphering procedure shall be used are defined in 3GPP TS 33.102 and ~~GSM~~3GPP TS 02.09 [5].

The authentication and ciphering procedure is always initiated and controlled by the network. However, in the case of a UMTS authentication challenge, there is the possibility for the MS to reject the network.

UMTS authentication challenge shall be supported by a MS supporting UMTS authentication algorithm .

NOTE: According to 3GPP TS 33.102, a ME supporting only A/Gb mode need not support the USIM interface and in consequence need not support the UMTS authentication challenge.

The authentication and ciphering procedure can be used for either:

- authentication only;
- setting of the GSM ciphering mode and the GSM ciphering algorithm only; or
- authentication and the setting of the GSM ciphering mode and the GSM ciphering algorithm.

In GSM, the network should not send any user data during the authentication and ciphering procedure.

A UMTS security context is established in the MS and the network when a UMTS authentication challenge is performed in GSM or in UMTS. After a successful UMTS authentication, the GPRS UMTS ciphering key, the GPRS UMTS integrity key, the GPRS GSM ciphering key and the GPRS ciphering key sequence number, are stored both in the network and the MS.

4.7.7b Authentication and ciphering procedure used for GSM authentication challenge

The purpose of the authentication and ciphering procedure is threefold (see ~~GSM~~3GPP TS 03.20 [13]):

- to permit the network to check whether the identity provided by the MS is acceptable or not;
- to provide parameters enabling the MS to calculate a new GPRS GSM ciphering key; and
- to let the network set the GSM ciphering mode (ciphering/no ciphering) and GSM ciphering algorithm.

The authentication and ciphering procedure can be used for either:

- authentication only;
- setting of the GSM ciphering mode and the GSM ciphering algorithm only; or
- authentication and the setting of the GSM ciphering mode and the GSM ciphering algorithm.

The cases in which the authentication and ciphering procedure shall be used are defined in ~~GSM~~3GPP TS 02.09 [5].

In GSM, the authentication and ciphering procedure is always initiated and controlled by the network. It shall be performed in a non ciphered mode because of the following reasons:

- the network cannot decipher a ciphered AUTHENTICATION AND CIPHERING RESPONSE from an unauthorised MS and put it on the black list; and

- to be able to define a specific point in time from which on a new GPRS GSM ciphering key should be used instead of the old one.

GSM authentication challenge shall be supported by a ME supporting GSM or UMTS radio access.

In GSM, the network should not send any user data during the authentication and ciphering procedure.

A GSM security context is established in the MS and the network when a GSM authentication challenge is performed in GSM or in UMTS. However, in UMTS an MS which supports the UMTS authentication algorithm shall not accept a GSM authentication challenge. After a successful GSM authentication challenge, the GPRS GSM ciphering key and the GPRS ciphering key sequence number, are stored both in the network and the MS.

4.7.7.1 Authentication and ciphering initiation by the network

The network initiates the authentication and ciphering procedure by transferring an AUTHENTICATION AND CIPHERING REQUEST message across the radio interface and starts timer T3360. The AUTHENTICATION AND CIPHERING REQUEST message shall contain all parameters necessary to calculate the response parameters when authentication is performed (see ~~GSM~~3GPP TS 03.20 [13] and 3GPP TS 33.102).

If authentication is requested, then the AUTHENTICATION AND CIPHERING REQUEST message shall contain either:

- In a GSM authentication challenge, the GPRS ciphering key sequence number, allocated to the GPRS GSM ciphering key and the RAND, or

- In a UMTS authentication challenge, the GPRS ciphering key sequence number, allocated to the GPRS UMTS ciphering and GPRS UMTS integrity keys, the RAND and the AUTN.

In GSM, if authentication is not requested, then the AUTHENTICATION AND CIPHERING REQUEST message shall not contain neither the GPRS ciphering key sequence number, the RAND nor the AUTN.

In GSM, if ciphering is requested, in a GSM authentication challenge or in a UMTS authentication challenge, then the AUTHENTICATION AND CIPHERING REQUEST message shall indicate the GPRS GSM ciphering algorithm.

The network includes the A&C reference number information element in the AUTHENTICATION AND CIPHERING REQUEST message. Its value is chosen in order to link an AUTHENTICATION AND CIPHERING REQUEST in a RA with its RESPONSE. The A&C reference number value might be based on the RA Colour Code value.

Additionally, the network may request the MS to include its IMEISV in the AUTHENTICATION AND CIPHERING RESPONSE message.

4.7.7.2 Authentication and ciphering response by the MS

In GSM, a MS that is attached to GPRS shall be ready to respond upon an AUTHENTICATION AND CIPHERING REQUEST message at any time.

In UMTS, an MS that is attached to GPRS shall be ready to respond upon an AUTHENTICATION AND CIPHERING REQUEST message at any time whilst a PS signalling connection exists.

A MS which does not support the UMTS authentication algorithm shall ignore the Authentication Parameter AUTN IE if included in the AUTHENTICATION AND CIPHERING REQUEST message and perform the GSM authentication challenge. It shall not perform the authentication of the network described in 4.7.7.5.1.

In a GSM authentication challenge, if the AUTHENTICATION AND CIPHERING REQUEST message includes the authentication parameters RAND and GPRS CKSN, then upon receipt of the message, the MS processes the challenge information and sends an AUTHENTICATION AND CIPHERING RESPONSE message to the network. The value of the received A&C reference number information element shall be copied into the A&C reference number information element in the AUTHENTICATION AND CIPHERING RESPONSE message. A GSM authentication challenge will result in the SIM passing a SRES and a GPRS GSM ciphering key to the ME. The new GPRS GSM ciphering key calculated from the challenge information shall overwrite the previous one and any previously stored GPRS UMTS ciphering and GPRS UMTS integrity keys shall be deleted. The calculated GSM ciphering key shall be stored on the

SIM together with the GPRS ciphering key sequence number before the AUTHENTICATION AND CIPHERING RESPONSE message is transmitted.

In a UMTS authentication challenge, if the AUTHENTICATION AND CIPHERING REQUEST message includes the UMTS authentication parameters GPRS CKSN, RAND and AUTN, then upon receipt of the message, the MS verifies the AUTN parameter and if this is accepted, the MS processes the challenge information and sends an AUTHENTICATION AND CIPHERING RESPONSE message to the network. The value of the received A&C reference number information element shall be copied into the A&C reference number information element in the AUTHENTICATION AND CIPHERING RESPONSE message. A UMTS authentication challenge will result in the SIM passing a RES, a GPRS UMTS ciphering key, a GPRS UMTS integrity key and a GPRS GSM ciphering key to the ME. The new GPRS UMTS ciphering key, GPRS UMTS integrity key and GPRS GSM ciphering key calculated from the challenge information shall overwrite the previous ones. The new GPRS UMTS ciphering key, GPRS UMTS integrity key and GPRS GSM ciphering key shall be stored on the SIM together with the GPRS ciphering key sequence number before the AUTHENTICATION AND CIPHERING RESPONSE message is transmitted.

In UMTS, an MS capable of UMTS only shall ignore the Ciphering Algorithm IE in the AUTHENTICATION AND CIPHERING REQUEST message. An MS capable of both UMTS and GSM shall store the received value in the Ciphering Algorithm IE in the AUTHENTICATION AND CIPHERING REQUEST message in order to use it at an inter system change from UMTS to GSM.

If the AUTHENTICATION AND CIPHERING REQUEST message does not include neither the GSM authentication parameters (RAND and GPRS CKSN) nor the UMTS authentication parameters (RAND, AUTN and GPRS CKSN), then upon receipt of the message, the MS replies by sending an AUTHENTICATION AND CIPHERING RESPONSE message to the network.

In GSM, the GMM layer shall notify the LLC layer if ciphering shall be used or not and if yes which GSM ciphering algorithm and GPRS GSM ciphering key that shall be used (see ~~GSM~~3GPP TS 04.64 [7~~8a6~~]).

A mobile station supporting UMTS authentication challenge shall support the following procedure:

In order to avoid a synchronisation failure, if the same RAND is received twice, the mobile station shall store the received RAND and the RES returned from the SIM in the volatile memory and compare it with any subsequently received RAND values, until the RAND value stored in the mobile station is deleted. If the stored RAND value is equal to the new received value in the AUTHENTICATION & CIPHERING REQUEST message, then the mobile station shall not pass the RAND to the SIM, but shall immediately send the AUTHENTICATION & CIPHERING RESPONSE message with the stored RES. If there is no valid stored RAND in the mobile station or the stored RAND is different from the new received value in the AUTHENTICATION & CIPHERING REQUEST message, the mobile station shall pass the RAND to the SIM, shall override any previously stored RAND and RES with the new ones and reset and restart timer T3316.

The RAND and RES values stored in the mobile station shall be deleted:

- upon receipt of a SECURITY MODE COMMAND (Iu mode only) or AUTHENTICATION & CIPHERING REJECT message;
- upon expiry of timer T3316; or
- if the mobile station enters the GMM states GMM-DEREGISTERED or GMM-NULL.

4.7.7.3 Authentication and ciphering completion by the network

Upon receipt of the AUTHENTICATION AND CIPHERING RESPONSE message, the network stops the timer T3360 and checks the validity of the response (see ~~GSM~~3GPP TS 03.20 [13] and 3GPP TS 33.102). For this, it may use the A&C reference number information element within the AUTHENTICATION AND CIPHERING RESPONSE message to determine whether the response is correlating to the last request that was sent.

In GSM, the GMM layer shall notify the LLC sublayer if ciphering shall be used or not and if yes which algorithm and GPRS GSM ciphering key that shall be used (see ~~GSM~~3GPP TS 04.64 [7~~8a6~~]).

Upon receipt of the AUTHENTICATION AND CIPHERING FAILURE message, the network stops the timer T3360. In Synch failure case, the core network may renegotiate with the HLR/AuC and provide the MS with new authentication parameters.

4.7.7.4 GPRS ciphering key sequence number

The security parameters for authentication and ciphering are tied together in sets. In a GSM authentication challenge, from a challenge parameter RAND both the authentication response parameter SRES and the GPRS GSM ciphering key can be computed given the secret key associated to the IMSI. In a UMTS authentication challenge, from a challenge parameter RAND, the authentication response parameter RES and the GPRS UMTS ciphering key and the GPRS UMTS integrity key can be computed given the secret key associated to the IMSI.

In order to allow start of ciphering on a logical link without authentication, GPRS ciphering key sequence numbers are introduced.

The GPRS ciphering key sequence number is managed by the network such that the AUTHENTICATION AND CIPHERING REQUEST message contains the GPRS ciphering key sequence number allocated to the GPRS GSM ciphering key (in case of a GSM authentication challenge) or the GPRS UMTS ciphering key and the GPRS UMTS integrity key (in case of a UMTS authentication challenge) which may be computed from the RAND parameter carried in that message.

The MS stores the GPRS ciphering key sequence number with the GPRS GSM ciphering key (in case of a GSM authentication challenge) and the GPRS UMTS ciphering key and the GPRS UMTS integrity key (in case of a UMTS authentication challenge),and includes the corresponding GPRS ciphering key sequence number in the ROUTING AREA UPDATE REQUEST , SERVICE REQUEST and ATTACH REQUEST messages.

If the GPRS ciphering key sequence number is deleted, the associated GPRS GSM ciphering key , GPRS UMTS ciphering key and GPRS UMTS integrity key shall be deleted (i.e. the established GSM security context or the UMTS security context is no longer valid).

In UMTS, the network may choose to start ciphering and integrity checking with the stored GPRS UMTS ciphering key and the stored GPRS UMTS integrity key (under the restrictions given in ~~GSM~~3GPP TS 02.09 and 3GPP TS 33.102) if the stored GPRS ciphering key sequence number and the one given from the MS are equal.

In GSM, the network may choose to start ciphering with the stored GPRS GSM ciphering key (under the restrictions given in ~~GSM~~3GPP TS 02.09) if the stored GPRS ciphering key sequence number and the one given from the MS are equal and the previously negotiated ciphering algorithm is known and supported in the network. When ciphering is requested at GPRS attach, the authentication and ciphering procedure shall be performed since the MS does not store the ciphering algorithm at detach.

Upon GPRS attach, if ciphering is to be used, an AUTHENTICATION AND CIPHERING REQUEST message shall be sent to the MS to start ciphering.

If the GPRS ciphering key sequence number stored in the network does not match the GPRS ciphering key sequence number received from the MS in the ATTACH REQUEST message, then the network should authenticate the MS.

In GSM, the MS starts ciphering after sending the AUTHENTICATION AND CIPHERING RESPONSE message. The network starts ciphering when a valid AUTHENTICATION AND CIPHERING RESPONSE is received from the MS.

In UMTS, the MS starts ciphering and integrity checking according to the conditions specified in specification 3GPP TS 25.331.

In GSM, as an option, the network may decide to continue ciphering without sending an AUTHENTICATION AND CIPHERING REQUEST message after receiving a ROUTING AREA UPDATE REQUEST message with a valid GPRS ciphering key sequence number. Both the MS and the network shall use the latest ciphering parameters. The network starts ciphering when sending the ciphered ROUTING AREA UPDATE ACCEPT message to the MS. The MS starts ciphering after receiving a valid ciphered ROUTING AREA UPDATE ACCEPT message from the network.

NOTE: In some specifications the term KSI (Key Set Identifier) is used instead of the term GPRS ciphering key sequence number.

4.7.7.8 Handling of keys at intersystem change from UMTS to GSM

At an intersystem change from UMTS to GSM, ciphering may be started (see ~~GSM~~3GPP TS 04.64 [78a~~6~~]) without any new authentication and ciphering procedure. Deduction of the appropriate security key for ciphering in GSM, depends on the current GSM/UMTS security context stored in the MS and the network.

The ME shall handle the GPRS GSM ciphering key according to Table 4.7.7.8.1.

Before any initial GMM message is sent in the new cell in GSM, the GMM layer in the MS shall notify the LLC layer if ciphering shall be used or not. If yes, the GPRS GSM ciphering key and the applicable ciphering algorithm according to the stored *Ciphering Algorithm IE* in the MS shall also be indicated to the LLC layer (see ~~GSM~~3GPP TS 04.64 [7~~8a6~~]).

4.7.8 Identification procedure

The identification procedure is used by the network to request an MS to provide specific identification parameters to the network e.g. International Mobile Subscriber Identity, International Mobile Equipment Identity (see 3GPP TS 23.003). For the presentation of the IMEI, the requirements of ~~GSM~~3GPP TS 02.09 apply.

4.7.9.1.1 Paging for GPRS services using P-TMSI

The network shall initiate the paging procedure for GPRS services using P-TMSI when GMM signalling messages or user data is pending to be sent to the MS while the Mobile Reachable timer is running. The network may page only GPRS MSs which are GMM-REGISTERED and identified by a local P-TMSI.

In UMTS, to initiate the procedure the GMM entity in the network requests the lower layer to start paging (see 3GPP TS 25.331 and 3GPP TS 25.413) and starts timer T3313. Upon reception of a paging indication, the MS shall respond to the paging with a SERVICE REQUEST message with service type "paging response" (see 3GPP TS 24.007 [20], 3GPP TS 23.060 [74], 3GPP TS 25.331 and 3GPP TS 25.413). If the paging request for GPRS services was received during an ongoing MS initiated GMM specific procedure, then the MS shall progress the GMM specific procedure, and the network shall proceed with the GMM specific procedure.

In GSM, to initiate the procedure the GMM entity requests the RR sublayer to start paging (see ~~GSM~~3GPP TS 04.18, ~~GSM~~3GPP TS 04.60 [7~~65~~], and starts timer T3313. Upon reception of a paging indication, the MS shall respond to the paging with any LLC frame (see 3GPP TS 24.007 [20], 3GPP TS 23.060 [74].

At intersystem change, an MS not having the READY timer running in GSM or an MS in PMM-IDLE mode in UMTS, being paged in a different access network as when it last sent user data or signalling message, uses ROUTING AREA UPDATE REQUEST message as paging response, i.e. the RA update procedure shall be performed instead according to the selective routing area update procedure.

The network shall stop timer T3313 when a response is received from the MS. When the timer T3313 expires the network may reinitiate paging.

In UMTS, when a response is received from the MS, the network shall change from PMM-IDLE mode to PMM-CONNECTED mode.

In GSM, when a response is received from the MS, the network shall start the READY timer.

4.7.9.1.2 Paging for GPRS services using IMSI

Paging for GPRS services using IMSI is an abnormal procedure used for error recovery in the network.

The network may initiate paging using IMSI if the P-TMSI is not available due to a network failure.

In UMTS, to initiate the procedure the GMM entity in the network requests the lower layer to start paging (see 3GPP TS 25.331 and 3GPP TS 25.413).

In GSM, to initiate the procedure the GMM entity in the network requests the RR sublayer to start paging (see ~~GSM~~3GPP TS 04.18, ~~GSM~~3GPP TS 04.60 [7~~65~~].

Upon reception of a paging indication for GPRS services using IMSI, the MS shall locally deactivate any active PDP contexts and locally detach from GPRS. The local detach includes deleting any RAI, P-TMSI, P-TMSI signature and GPRS ciphering key sequence number stored, setting the GPRS update status to GU2 NOT UPDATED and changing state to GMM-DEREGISTERED.

In UMTS, when an MS receives a paging request for GPRS services using the IMSI from the network before an MS initiated GMM specific procedure has been completed, then the MS shall abort the GMM specific procedure, and the MS shall proceed according to the description in this clause.

After performing the local detach, the MS shall then perform a GPRS attach or combined GPRS attach procedure.

After performing the attach, a MS should activate PDP context(s) to replace any previously active PDP context(s).

NOTE 1: In some cases, user interaction may be required and then the MS cannot activate the PDP context(s) automatically.

NOTE 2: The MS does not respond to the paging except with the Attach Request. Hence timer T3313 in the network is not used when paging with IMSI.

NOTE 3: Paging without DRX parameters may require a considerable extension of the paging duration.

4.7.9.2 Paging for non-GPRS services

The network may initiate the paging procedure for non-GPRS services when the MS is IMSI attached for non-GPRS services.

In UMTS, to initiate the procedure the GMM entity requests the lower layer to start paging (see 3GPP TS 25.331 and 3GPP TS 25.413) for non-GPRS services.

In GSM, to initiate the procedure the GMM entity requests the RR sublayer to start paging (see ~~GSM~~3GPP TS 04.18 ~~GSM~~3GPP TS 04.60 [76~~5~~] for non-GPRS services.

The MS identity used for paging shall be the allocated TMSI if acknowledged by the MS, otherwise the IMSI.

5.2.1.9 Traffic channel assignment at mobile originating call establishment

The mobile station supporting multicall includes the Stream Identifier (SI) in the SETUP message. The multicall supporting network shall interprets the SI value as follows:

a) Mobile station generates a new SI value at the initiation of an originating call, then a new traffic channel shall be assigned to the mobile originating call.

b) Mobile station indicates an existing SI value, then the indicated traffic channel shall be used for the mobile originating call.

Mobile station supporting multicall shall never send an additional SETUP with indication that a new traffic channel is requested to a network that does not support multicall.

It is a network dependent decision when to initiate the assignment of an appropriate traffic channel during the mobile originating call establishment phase. Initiation of a suitable RR procedure to assign an appropriate traffic channel does neither change the state of a call control entity nor affect any call control timer.

NOTE: During certain phases of such an RR procedure, transmission of CC and MM messages may be suspended, see ~~GSM~~3GPP TS 04.18, clause 3 and ~~GSM~~3GPP TS 08.08.

The assignment procedure does not affect any call control timer.

5.2.1.10 Call queuing at mobile originating call establishment

~~The conditions to apply queuing are described in GSM 03.01.~~

If an idle traffic channel is not available at the assignment instant, the network may place the traffic channel request in a queue. Calls arriving when all positions in the queue are occupied shall be cleared by the network using the cause #34 "no circuit/channel available".

The maximum queuing interval is supervised by the network. The limit is a network dependent choice. In case the network is not able to allocate a traffic channel within the queuing limit, the network will release the call using cause #34 "no circuit/channel available".

Optionally, e.g. if eMLPP is used, the network may decide to pre-empt existing calls or to place the traffic channel request at some preferential position within the queue.

Specific indications provided in the network to the remote user are a network dependent choice.

5.2.2.3.3 Call failure procedures

In case of abnormal behaviour the following call failure procedures apply:

i. If the network does not receive any response to the SETUP message prior to the expiration of timer T303, then the network shall: initiate clearing procedures towards the calling user with cause #18 "no user responding"; and initiate clearing procedures towards the called mobile station in accordance with 5.4.4 using cause #102 "recovery on timer expiry".

ii. If the network has received a CALL CONFIRMED message, but does not receive an ALERTING, CONNECT or DISCONNECT message prior to the expiration of timer T310, then the network shall:

- initiate clearing procedures towards the calling user with cause #18 "no user responding"; and
- initiate clearing procedures towards the called MS in accordance with clause 5.4.4 using cause #102 "recovery on timer expiry".

iii. If the network has received an ALERTING message, but does not receive a CONNECT or DISCONNECT message prior to the expiry of timer T301 (or a corresponding internal alerting supervision timing function), then the network shall: initiate clearing procedures towards the calling user with cause #19 "user alerting, no answer"; and initiate clearing procedures towards the called mobile station in accordance with clause 5.4.4, using cause #102 "recovery on timer expiry" or using cause #31 "normal, unspecified".

NOTE: The choice between cause #31 and cause #102 may have consequences on indications generated by the mobile station, see ~~GSM~~3GPP TS ~~02.40~~22.001 [8a].

5.2.3.2.1 Recall Alignment Procedure

The recall alignment procedure consists of three parts :

- basic service group alignment,
- facility alignment, and
- stream identifier alignment.

Basic service group alignment.

The mobile station shall check that the *Bearer Capability*, *HLC* and *LLC* and *Repeat Indicator* fields, which are embedded in the *Setup Container IE*, match a basic service group supported by the mobile station.

If this check fails, then the recall alignment procedure has failed. The mobile station shall use the cause #88 "incompatible destination" afterwards.

Otherwise, the mobile station is allowed to alter the content within the *Bearer Capability*, *HLC* and *LLC* Information Elements (e.g. the speech coder version(s), the data rate, the radio channel requirement) provided that the basic service group is not changed. The result shall be that the mobile station has derived *Bearer Capability*, *HLC* and *LLC* Information Elements, which it can use for a later call setup according to its configuration and capabilities.

Facility alignment:

This only applies if the *Setup Container* contains 1 or more *Facility IEs.* Each *Facility IE* within the *Setup Container* will be associated with the common *SS Version IE*, if present. The handling for each *Facility IE* is defined below. The mobile station shall align each facility IE contained in the *Setup Container*. The rules defined in ~~GSM~~3GPP TS ~~04.10~~24.010 also apply.

The *Facility IE* is encoded as 'simple recall alignment', 'advanced recall alignment' or 'recall alignment not essential' (see ~~GSM~~3GPP TS ~~04.10~~24.010). If the encoding indicates, that

- a simple recall alignment is required, the mobile station shall copy the Facility IE and the common SS version IE from the *Setup Container* to the SETUP message without modifying the content.
- an advanced recall alignment is required, the mobile station must recognise and support the operation defined in the facility. If the mobile station does not recognise or support the operation, then the recall alignment procedure

has failed and the mobile station shall use the cause #29 "facility rejected" in the subsequent rejection of the CC establishment request.

- the recall alignment is not essential, then the facility operation is not an essential part of the SETUP. If the MS does not recognise the operation then the SS Version IE and Facility IE are discarded, and NOT copied into the SETUP message.

NOTE: A mobile station may include a *Facility IE* without an associated *SS Version IE*. This would indicate that the SS operation is encoded using Phase 1 protocols.

Further details on Facility handling are given in ~~GSM~~3GPP TS ~~04.10~~24.010

Stream identifier alignment:

The mobile station shall check whether the *Stream Identifier* field is contained in the *Setup Container* or not.

If the *Stream Identifier* is contained in the *Setup Container*, the mobile station shall behave as one of the following.

- the mobile station re-assign the *Stream Identifier* value, and modify the *Stream Identifier* field.
- the mobile station remove the *Stream Identifier* field.

If the *Stream Identifier* is not contained in the *Setup Container*, the mobile station may behave as follows.

- the mobile station assign the *Stream Identifier* value, and add the *Stream Identifier IE* to the end of the SETUP message.

5.3.4 Support of Dual Services

The behaviour described in this clause is used to realize the following required services throughout clause 5.3.4. The mobile station is not obliged to support the network originated in-call modification procedure. In that case, the mobile station shall, when receiving a MODIFY message, treat the message as unknown and react as described in clause 8.4. If the mobile station is already prepared to support the procedure in both directions, it shall act as described in this clause.

Alternate Speech/Group 3 fax (Teleservice 61 according to ~~GSM~~3GPP TS ~~02.03~~22.003).

5.4.1 Terminology

The following terms are used in the present document in the description of clearing procedures:

- A traffic channel (see ~~GSM~~3GPP TS 04.03) is "connected" when the channel is part of a circuit-switched connection established according to the present document.
- A traffic channel is "disconnected" when the channel is no longer part of a circuit-switched connection, but is not yet available for use in a new connection.

6.1.2 Session management states

In this clause, the SM states are described for one SM entity (see 3GPP TS 24.007 [20]). Each SM entity is associated with one PDP context. Clause 6.1.2.1 describes the SM states in the MS and clause 6.1.2.2 describes the SM states on the network side.

7 Examples of structured procedures

See 3GPP TS 23.108 [9a].

8 Handling of unknown, unforeseen, and erroneous protocol data

8.1 General

The procedures specified in 3GPP TS 24.008 and call-related supplementary service handling in 3GPP TS 24.010 apply to those messages which pass the checks described in this clause.

This clause also specifies procedures for the handling of unknown, unforeseen, and erroneous protocol data by the receiving entity. These procedures are called "error handling procedures", but in addition to providing recovery mechanisms for error situations they define a compatibility mechanism for future extensions of the protocols.

Error handling concerning the value part of the Facility IE and of the SS Version Indicator IE are not in the scope of the present document. It is defined in 3GPP TS 24.010 and the ~~GSM~~3GPP TS ~~04.8~~24.08x series.

Clauses 8.1 to 8.8 shall be applied in order of precedence.

Most error handling procedures are mandatory for the mobile station.

Detailed error handling procedures in the network are implementation dependent and may vary from PLMN to PLMN. However, when extensions of this protocol are developed, networks will be assumed to have the error handling that is indicated in this clause as mandatory ("shall") and that is indicated as strongly recommended ("should"). Clauses 8.2, 8.3, 8.4, 8.5 and 8.7.2 do not apply to the error handling in the network applied to the receipt of initial layer 3 message: If the network diagnoses an error described in one of these clauses in the initial layer 3 message received from the mobile station, it shall either:

- try to recognize the classmark and then take further implementation dependent actions; or
- release the RR-connection.

Also, the error handling of the network is only considered as mandatory or strongly recommended when certain thresholds for errors are not reached during a dedicated connection.

For definition of semantical and syntactical errors see 3GPP TS 24.007 [20], subclause 11.4.2.

8.5 Non-semantical mandatory information element errors

When on receipt of a message,

- an "imperative message part" error; or
- a "missing mandatory IE" error

is diagnosed or when a message containing:

- a syntactically incorrect mandatory IE; or
- an IE unknown in the message, but encoded as "comprehension required" (see ~~GSM~~3GPP TS ~~04.07~~24.007); or
- an out of sequence IE encoded as "comprehension required" (see ~~clause~~ 3GPP TS ~~04.07~~24.007)

is received,

- the mobile station shall proceed as follows:

  If the message is not one of the messages listed in clauses 8.5.1, 8.5.2, 8.5.3, 8.5.4 and 8.5.5 a) or b), the mobile station shall ignore the message except for the fact that, if an RR connection exists, it shall return a status message (STATUS, MM STATUS depending on the protocol discriminator) with cause # 96 "Invalid mandatory information". If the message was a GMM message the GMM-STATUS message with cause #96 " Invalid mandatory information" shall be returned. If the message was an SM message the SM-STATUS message with cause # 96 "invalid mandatory information" shall be returned.

- the network shall proceed as follows:

  When the message is not one of the messages listed in clause 8.5.3 b), c), d) or e) and 8.5.5 a) or c), the network shall either:

  - try to treat the message (the exact further actions are implementation dependent), or
  - ignore the message except that it should return a status message (STATUS, or MM STATUS (depending on the protocol discriminator), GMM STATUS, or SM STATUS) with cause # 96 "Invalid mandatory information".

8.6.1 IEIs unknown in the message

The MS shall ignore all IEs unknown in a message which are not encoded as "comprehension required" (see ~~GSM~~3GPP TS ~~04.07~~24.007).

The network shall take the same approach.

8.8 Messages with semantically incorrect contents

When a message with semantically incorrect contents is received, the foreseen reactions of the procedural part of 3GPP TS 24.008 (i.e. of clauses 3, 4, 5) are performed. If however no such reactions are specified, the MS shall ignore the message except for the fact that, if an RR connection exists, it returns a status message (STATUS, or MM STATUS depending on the PD) with cause value # 95 "semantically incorrect message".

The network should follow the same procedure except that a status message is not normally transmitted.

Semantic checking of the Facility information element value part (defined in 3GPP TS 24.080) is the subject of the technical specifications 3GPP TS 24.010 [21] and the ~~GSM~~3GPP TS ~~04.8~~24.08x series.

9.3.9.1 Facility (network to mobile station direction)

This message is sent by the network to the mobile station to request or acknowledge a supplementary service. The supplementary service to be invoked and its associated parameters are specified in the facility information element.

See table 9.62a/3GPP TS 24.008.

Message type: FACILITY

Significance: local (NOTE 1)

Direction: network to mobile station

Table 9.62a/3GPP TS 24.008: FACILITY 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
	Facility message type	Message type 10.4	M	V	1
	Facility (note 2)	Facility 10.5.4.15	M	LV	1-?

NOTE 1: This message has local significance; however, it may carry information of global significance.

NOTE 2: The *facility* information element has no upper length limit except that given by the maximum number of octets in a L3 message, see ~~GSM~~3GPP TS 04.06.

9.3.9.2 Facility (mobile station to network direction)

This message is sent by the mobile station to the network to request or acknowledge a supplementary service. The supplementary service to be invoked and its associated parameters are specified in the facility information element.

See table 9.62b/3GPP TS 24.008.

Message type: FACILITY

Significance: local (note 1)

Direction: mobile station to network

Table 9.62b/3GPP TS 24.008: FACILITY message content (mobile station to network 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
	Facility message type	Message type 10.4	M	V	1
	Facility (note 2)	Facility 10.5.4.15	M	LV	1-?
7F	SS version	SS version indicator 10.5.4.24	O	TLV	2-3

NOTE 1: This message has local significance; however, it may carry information of global significance.

NOTE 2: The *facility* information element has no upper length limit except that given by the maximum number of octets in a L3 message, see ~~GSM~~3GPP TS 04.06.

9.3.23.1.16 Alert $(Network Indication of Alerting in the MS)$

May be included by the network to give some indication about alerting (category or level). If supported in the MS, this optional indication is to be used by the MS as specified in ~~GSM~~3GPP TS ~~02.07~~22.101 [8].

9.3.23.2.2 Facility

The information element may be included for functional operation of supplementary services.

Three different codings of this IE exist, for further details see 3GPP TS ~~04.10~~24.010.

9.4.9 Authentication and ciphering request

This message is sent by the network to the MS to initiate authentication of the MS identity. Additionally, the ciphering mode is set, indicating whether ciphering will be performed or not. See table 9.4.9/~~GSM~~3GPP TS 24.008.

Message type: AUTHENTICATION AND CIPHERING REQUEST

Significance: dual

Direction: network to MS

Table 9.4.9/~~GSM~~3GPP TS 24.008: AUTHENTICATION AND CIPHERING REQUEST message content

IEI	Information Element	Type/Reference	Presence	Format	Length
	Protocol discriminator	Protocol discriminator 10.2	M	V	1/2
	Skip indicator	Skip indicator 10.3.1	M	V	1/2
	Authentication and ciphering request message identity	Message type 10.4	M	V	1
	Ciphering algorithm	Ciphering algorithm 10.5.5.3	M	V	1/2
	IMEISV request	IMEISV request 10.5.5.10	M	V	1/2
	Force to standby	Force to standby 10.5.5.7	M	V	1/2
	A&C reference number	A&C reference number 10.5.5.19	M	V	1/2
21	Authentication parameter RAND	Authentication parameter RAND 10.5.3.1	O	TV	17
8-	GPRS ciphering key sequence number	Ciphering key sequence number 10.5.1.2	C	TV	1
28	Authentication parameter AUTN	Authentication parameter AUTN 10.5.3.1.1	O	TLV	18

10.1 Overview

Within the Layer 3 protocols defined in ~~GSM~~3GPP TS 24.~~1~~008, every message is a standard L3 message as defined in 3GPP TS 24.007 [20]. This means that the message consists of the following parts:

a) protocol discriminator;

b) transaction identifier;

c) message type;

d) other information elements, as required.

This organization is illustrated in the example shown in figure 10.1/3GPP TS 24.008.

10.5.1.5 Mobile Station Classmark 1

The purpose of the *Mobile Station Classmark 1* information element is to provide the network with information concerning aspects of high priority of the mobile station equipment. This affects the manner in which the network handles the operation of the mobile station. The Mobile Station Classmark information indicates general mobile station characteristics and it shall therefore, except for fields explicitly indicated, be independent of the frequency band of the channel it is sent on.

The *Mobile Station Classmark 1* information element is coded as shown in figure 10.5.5/3GPP TS 24.008 and table 10.5.5/3GPP TS 24.008.

The *Mobile Station Classmark 1* is a type 3 information element with 2 octets length.

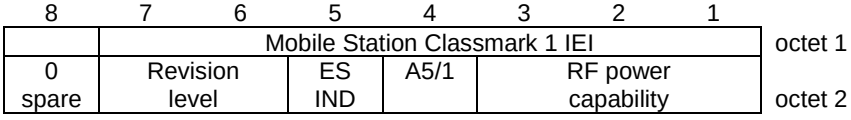

Figure 10.5.5/3GPP TS 24.008 *Mobile Station Classmark 1* information element

Table 10.5.5/3GPP TS 24.008: *Mobile Station Classmark 1* information element

Revision level (octet 2)
Bits
7 6
0 0 Reserved for GSM phase 1
0 1 Used by GSM phase 2 mobile stations
1 0 Used by mobile stations supporting R99 or later versions of the protocol
1 1 Reserved for future use

ES IND (octet 2, bit 5) "Controlled Early Classmark Sending" option implementation
An MS not supporting GSM shall set this bit to '0'.
An MS supporting GSM shall indicate the associated GSM capability (see table):

0 "Controlled Early Classmark Sending" option is not implemented in the MS
1 "Controlled Early Classmark Sending" option is implemented in the MS

NOTE: The value of the ES IND gives the implementation in the MS. It's value is **not** dependent on the broadcast SI 3 Rest Octet <Early Classmark Sending Control> value.

A5/1 algorithm supported (octet 2, bit4)
An MS not supporting GSM shall set this bit to '1'.
An MS supporting GSM shall indicate the associated GSM capability (see table):

0 encryption algorithm A5/1 available
1 encryption algorithm A5/1 not available

RF power capability (octet 2)
When GSM 450, GSM 480, GSM 850, GSM 900 P, E [or R] band is used (for exceptions see ~~GSM~~3GPP TS 04.18), the MS shall indicate the RF power capability of the band used (see table);
When UMTS is used, a single band GSM 450, GSM 480, GSM 850, GSM 900 P, E [or R] MS shall indicate the RF power capability corresponding to the (GSM) band it supports (see table); in this case information on which single band is supported is found in classmark 3.
Bits
3 2 1
0 0 0 class 1
0 0 1 class 2
0 1 0 class 3
0 1 1 class 4
1 0 0 class 5
All other values are reserved.

When the DCS 1800 or PCS 1900 band is used (for exceptions see 3GPP TS 04.18, sub-clause 3.4.18), the MS shall indicate the RF power capability of the band used (see table):
When UMTS is used, a single band DCS1800 or PCS 1900 MS shall indicate the RF power capability corresponding to the (GSM) band it supports (see table); in this case information on which single band is supported is found in classmark 3.
Bits
3 2 1
0 0 0 class 1
0 0 1 class 2
0 1 0 class 3
All other values are reserved.

When UMTS is used, an MS not supporting any GSM band or a multiband GSM MS shall code this field as follows (see table):
Bits
3 2 1
1 1 1 RF Power capability is irrelevant in this information element
All other values are reserved.

10.5.1.6 Mobile Station Classmark 2

The purpose of the *Mobile Station Classmark 2* information element is to provide the network with information concerning aspects of both high and low priority of the mobile station equipment. This affects the manner in which the network handles the operation of the mobile station. The Mobile Station Classmark information indicates general mobile station characteristics and it shall therefore, except for fields explicitly indicated, be independent of the frequency band of the channel it is sent on.

The *Mobile Station Classmark 2* information element is coded as shown in figure 10.5.6/3GPP TS 24.008, table 10.5.6a/3GPP TS 24.008 and table 10.5.6b/3GPP TS 24.008.

The *Mobile Station Classmark 2* is a type 4 information element with 5 octets length.

8	7	6	5	4	3	2	1	
	Mobile station classmark 2 IEI							octet 1
Length of mobile station classmark 2 contents								octet 2
0 spare	Revision level		ES IND	A5/1	RF power capability			octet 3
0 spare	PS capa.	SS Screen. Indicator		SM ca pabi.	VBS	VGCS	FC	octet 4
CM3	0 spare	LCSVA CAP	UCS2	SoLSA	CMSP	A5/3	A5/2	octet 5

NOTE: Owing to backward compatibility problems, bit 8 of octet 4 should not be used unless it is also checked that the bits 8, 7 and 6 of octet 3 are not "0 0 0".

Figure 10.5.6/3GPP TS 24.008 *Mobile Station Classmark 2* information element

Table 10.5.6a/3GPP TS 24.008: *Mobile Station Classmark 2* information element

Revision level (octet 3)
Bits
7 6
0 0 Reserved for GSM phase 1
0 1 Used by GSM phase 2 mobile stations
1 0 Used by mobile stations supporting R99 or later versions of the protocol
1 1 Reserved for future use

ES IND (octet 3, bit 5) "Controlled Early Classmark Sending" option implementation
An MS not supporting GSM shall set this bit to ‘0’.
An MS supporting GSM shall indicate the associated GSM capability (see table):

0 "Controlled Early Classmark Sending" option is not implemented in the MS
1 "Controlled Early Classmark Sending" option is implemented in the MS

NOTE: The value of the ES IND gives the implementation in the MS. It's value is **not** dependent on the broadcast SI 3 Rest Octet <Early Classmark Sending Control> value

Table 10.5.6a/3GPP TS 24.008: *Mobile Station Classmark 2* information element

A5/1 algorithm supported (octet 3, bit 4)
An MS not supporting GSM shall set this bit to '1'.
An MS supporting GSM shall indicate the associated GSM capability (see table):

0 encryption algorithm A5/1 available
1 encryption algorithm A5/1 not available

RF Power Capability (Octet 3)

When GSM 450, GSM 480, GSM 850, GSM 900 P, E [or R] band is used (for exceptions see ~~GSM~~3GPP TS 04.18), the MS shall indicate the RF power capability of the band used (see table);
When UMTS is used, a single band GSM 450, GSM 480, GSM 850, GSM 900 P, E [or R] MS shall indicate the RF power capability corresponding to the (GSM) band it supports (see table); in this case information on which single band is supported is found in classmark 3.
Bits

3	**2**	**1**	
0	0	0	class 1
0	0	1	class 2
0	1	0	class 3
0	1	1	class 4
1	0	0	class 5

All other values are reserved.

When the DCS 1800 or PCS 1900 band is used (for exceptions see ~~GSM~~3GPP TS 04.18), the MS shall indicate the RF power capability of the band used (see table) ;
When UMTS is used, a single band DCS1800 or PCS 1900 MS shall indicate the RF power capability corresponding to the (GSM) band it supports (see table); in this case information on which single band is supported is found in classmark 3.
Bits

3	**2**	**1**	
0	0	0	class 1
0	0	1	class 2
0	1	0	class 3

All other values are reserved.

When UMTS is used, an MS not supporting any GSM ban d or a multiband GSM MS shall code this field as follows (see table):
Bits

3	**2**	**1**	
1	1	1	RF Power capability is irrelevant in this information element

All other values are reserved.

PS capability (pseudo-synchronization capability) (octet 4)
An MS not supporting GSM shall set this bit to '0'.
An MS supporting GSM shall indicate the associated GSM capability (see table):
Bit **7**

0 PS capability not present
1 PS capability present

SS Screening Indicator (octet 4)
Bits

6	**5**	
0	0	defined in 3GPP TS 24.080
0	1	defined in 3GPP TS 24.080
1	0	defined in 3GPP TS 24.080
1	1	defined in 3GPP TS 24.080

SM capability (MT SMS pt to pt capability) (octet 4)
Bit **4**

0 Mobile station does not support mobile terminated point to point SMS
1 Mobile station supports mobile terminated point to point SMS

Table 10.5.6a/3GPP TS 24.008: *Mobile Station Classmark 2* information element

VBS notification reception (octet 4)
An MS not supporting GSM shall set this bit to '0'.
An MS supporting GSM shall indicate the associated GSM capability (see table):
Bit **3**
0 no VBS capability or no notifications wanted
1 VBS capability and notifications wanted

VGCS notification reception (octet 4)
An MS not supporting GSM shall set this bit to '0'.
An MS supporting GSM shall indicate the associated GSM capability (see table):
Bit **2**
0 no VGCS capability or no notifications wanted
1 VGCS capability and notifications wanted

FC Frequency Capability (octet 4)
When the GSM 400 or GSM 850 or DCS 1800 or PCS 1900 band or UMTS is used (for exceptions see ~~GSM~~3GPP TS 04.18, for definitions of frequency band see ~~GSM~~3GPP TS 05.05), this bit shall be sent with the value '0'.

Note: This bit conveys no information about support or non support of the E-GSM or R-GSM bands when GSM 400, GSM 850, DCS1800, PCS1900 band or UMTS is used.

When a GSM 900 band is used (for exceptions see ~~GSM~~3GPP TS 04.18):
Bit **1**
0 The MS does not support the E-GSM or R-GSM band (For definition of frequency bands see ~~GSM~~3GPP TS 05.05)
1 The MS does support the E-GSM or R-GSM (For definition of frequency bands see ~~GSM~~3GPP TS 05.05)
Note: For mobile station supporting the R-GSM band further information can be found in MS Classmark 3.

CM3 (octet 5, bit 8)

0 The MS does not support any options that are indicated in CM3
1 The MS supports options that are indicated in classmark 3 IE

LCS VA capability (LCS value added location request notification capability) (octet 5,bit 6)

0 LCS value added location request notification capability not supported
1 LCS value added location request notification capability supported

UCS2 treatment (octet 5, bit 5)

This information field indicates the likely treatment by the mobile station of UCS2 encoded character strings. For backward compatibility reasons, if this field is not included, the value 0 shall be assumed by the receiver.
0 the ME has a preference for the default alphabet (defined in ~~GSM~~3GPP TS ~~03.38~~23.038 [8b]) over UCS2.
1 the ME has no preference between the use of the default alphabet and the use of UCS2.

Table 10.5.6a/3GPP TS 24.008: *Mobile Station Classmark 2* information element

SoLSA (octet 5, bit 4)
An MS not supporting GSM shall set this bit to ‘0’.
An MS supporting GSM shall indicate the associated GSM capability (see table):
0 The ME does not support SoLSA.
1 The ME supports SoLSA.

CMSP: CM Service Prompt (octet 5, bit 3) $(CCBS)$

0 "Network initiated MO CM connection request" not supported.
1 "Network initiated MO CM connection request" supported for at least one CM protocol.

A5/3 algorithm supported (octet 5, bit 2)
An MS not supporting GSM shall set this bit to ‘0’.
An MS supporting GSM shall indicate the associated GSM capability (see table):
0 encryption algorithm A5/3 not available
1 encryption algorithm A5/3 available

A5/2 algorithm supported (octet 5, bit 1)
An MS not supporting GSM shall set this bit to ‘0’.
An MS supporting GSM shall indicate the associated GSM capability (see table):
0 encryption algorithm A5/2 not available
1 encryption algorithm A5/2 available

NOTE: Additional mobile station capability information might be obtained by invoking the classmark interrogation procedure when GSM is used.

10.5.1.7 Mobile Station Classmark 3

The purpose of the *Mobile Station Classmark 3* information element is to provide the network with information concerning aspects of the mobile station. The contents might affect the manner in which the network handles the operation of the mobile station. The Mobile Station Classmark information indicates general mobile station characteristics and it shall therefore, except for fields explicitly indicated, be independent of the frequency band of the channel it is sent on.

The *MS Classmark 3* is a type 4 information element with a maximum of 14 octets length.

The value part of a *MS Classmark 3* information element is coded as shown in figure 10.5.7/3GPP TS 24.008 and table 10.5.7/3GPP TS 24.008.

NOTE: The 14 octet limit is so that the CLASSMARK CHANGE message will fit in one layer 2 frame.

SEMANTIC RULE : a multiband mobile station shall provide information about all frequency bands it can support. A single band mobile station shall not indicate the band it supports in the *Multiband Supported, GSM 400 Bands Supported, GSM 850 Associated Radio Capability* or PCS *1900 Associated Radio Capability* fields in the MS Classmark 3. Due to shared radio frequency channel numbers between DCS 1800 and PCS 1900, the mobile should indicate support for either DCS 1800 band OR PCS 1900 band.

SEMANTIC RULE : a mobile station shall include the MS Measurement Capability field if the *Multi Slot Class* field contains a value of 19 or greater (see ~~GSM~~3GPP TS 05.02).

Typically, the number of spare bits at the end is the minimum to reach an octet boundary. The receiver may add any number of bits set to "0" at the end of the received string if needed for correct decoding.

```
<Classmark 3 Value part> ::=
    < spare bit >
    {    < Multiband supported : { 000 } >
             < A5 bits >
    |    < Multiband supported : { 101 | 110 } >
             < A5 bits >
             < Associated Radio Capability 2 : bit(4) >
             < Associated Radio Capability 1 : bit(4) >
    |    < Multiband supported : { 001 | 010 | 100 } >
             < A5 bits >
             < spare bit >(4)
             < Associated Radio Capability 1 : bit(4) > }
    { 0 | 1 < R Support > }
    { 0 | 1 < Multi Slot Capability > }
    < UCS2 treatment: bit >
    < Extended Measurement Capability : bit >
    { 0 | 1 < MS measurement capability > }
    { 0 | 1 < MS Positioning Method Capability > }
    { 0 | 1 < EDGE Multi Slot Capability > }
    { 0 | 1 < EDGE Struct > }
    { 0 | 1 < GSM 400 Bands Supported : { 01 | 10 | 11 } >
             < GSM 400 Associated Radio Capability: bit(4) > }

    { 0 | 1 <GSM 850 Associated Radio Capability : bit(4) > }
    { 0 | 1 <PCS 1900 Associated Radio Capability : bit(4) > }
    < UMTS FDD Radio Access Technology Capability : bit >
    < UMTS TDD Radio Access Technology Capability : bit >
    < CDMA 2000 Radio Access Technology Capability : bit >

    { 0 | 1  < DTM GPRS Multi Slot Sub-Class : bit(2) >
             < MAC Mode Support : bit >
             { 0 | 1< DTM EGPRS Multi Slot Sub-Class : bit(2) > } }
    { 0 | 1 < Single Band Support > }
    < spare bit >** ;

< A5 bits > ::=
    < A5/7 : bit > < A5/6 : bit > < A5/5 : bit > < A5/4 : bit >  ;

<R Support>::=
    < R-GSM band Associated Radio Capability : bit(3) > ;

< Multi Slot Capability > ::=
    < Multi Slot Class : bit(5) >  ;

< MS Measurement capability > ::=
    < SMS_VALUE : bit (4) >
    < SM_VALUE : bit (4) > ;

< MS Positioning Method Capability > ::=
    < MS Positioning Method : bit(5) > ;

< EDGE Multi Slot Capability > ::=
    < EDGE Multi Slot Class : bit(5) > ;

 <EDGE Struct> : :=
    < Modulation Capability : bit >
    { 0 | 1 < EDGE RF Power Capability 1: bit(2) > }
    { 0 | 1 < EDGE RF Power Capability 2: bit(2) > } ;

< Single Band Support > ::=
    < GSMBand : bit(4) > ;
```

Figure 10.5.7/3GPP TS 24.008 *Mobile Station Classmark 3* information element

Table 10.5.7/3GPP TS 24.008: *Mobile Station Classmark 3* information element

Multiband Supported (3 bit field)

Band 1 supported (third bit of the field)
Bit 3
0 P-GSM not supported
1 P-GSM supported

Band 2 supported (second bit of the field)
BIT 2
0 E-GSM or R-GSM not supported
1 E-GSM or R-GSM supported

Band 3 supported (first bit of the field)
Bit 1
0 DCS 1800 not supported
1 DCS 1800 supported

The indication of support of P-GSM band or E-GSM or R-GSM band is mutually exclusive.

When the 'Band 2 supported' bit indicates support of E-GSM or R-GSM, the presence of the <R Support> field, see below, indicates if the E-GSM or R-GSM band is supported.

In this version of the protocol, the sender indicates in this field either none, one or two of these 3 bands supported.

For single band mobile station or a mobile station supporting none of the GSM 900 bands(P-GSM, E-GSM and R-GSM) and DCS1800 bands, all bits are set to 0.

A5/4
Bit 1
0 Encryption algorithm A5/4 not available
1 Encryption algorithm A5/4 available

A5/5
Bit 1
0 Encryption algorithm A5/5 not available
1 Encryption algorithm A5/5 available

A5/6
Bit 1
0 Encryption algorithm A5/6 not available
1 Encryption algorithm A5/6 available

A5/7
0 Encryption algorithm A5/7 not available
1 Encryption algorithm A5/7 available

Associated Radio capability 1 and 2 (4 bit fields)

If either of P-GSM or E-GSM or R-GSM is supported, the radio capability 1 field indicates the radio capability for P-GSM, E-GSM or R-GSM, and the radio capability 2 field indicates the radio capability for DCS1800 if supported, and is spare otherwise.

If none of P-GSM or E-GSM or R-GSM are supported, the radio capability 1 field indicates the radio capability for DCS1800, and the radio capability 2 field is spare.

The radio capability contains the binary coding of the power class associated with the band indicated in multiband support bits (see ~~GSM~~3GPP TS 05.05).

(continued...)

Table 10.5.1.7/3GPP TS 24.008 (continued): *MS Classmark 3* information element

R Support

In case where the R-GSM band is supported the R-GSM band associated radio capability field contains the binary coding of the power class associated (see ~~GSM~~3GPP TS 05.05) (regardless of the number of GSM bands supported). A mobile station supporting the R-GSM band shall also when appropriate, (see 10.5.1.6) indicate its support in the 'FC' bit in the Mobile Station Classmark 2 information element.

Note: the coding of the power class for P-GSM, E-GSM, R-GSM and DCS 1800 in radio capability 1 and/or 2 is different to that used in the Mobile Station Classmark 1 and Mobile Station Classmark 2 information elements.

Multi Slot Class (5 bit field)

In case the MS supports the use of multiple timeslots then the Multi Slot Class field is coded as the binary representation of the multislot class defined in 3GPP TS ~~GSM~~ 05.02.

UCS2 treatment (1 bit field)

This information field indicates the likely treatment by the mobile station of UCS2 encoded character strings. If not included, the value 0 shall be assumed by the receiver.
Bit 1
0 the ME has a preference for the default alphabet (defined in ~~GSM~~3GPP TS ~~03.38~~23.038 [8b]) over UCS2.
1 the ME has no preference between the use of the default alphabet and the use of UCS2.

Extended Measurement Capability (1 bit field)

This bit indicates whether the mobile station supports 'Extended Measurements' or not
Bit 1
0 the MS does not support Extended Measurements
1 the MS supports Extended Measurements

SMS_VALUE (Switch-Measure-Switch) (4 bit field)
The SMS field indicates the time needed for the mobile station to switch from one radio channel to another, perform a neighbour cell power measurement, and the switch from that radio channel to another radio channel.
Bits
4 3 2 1
0 0 0 0 1/4 timeslot (~144 microseconds)
0 0 0 1 2/4 timeslot (~288 microseconds)
0 0 1 0 3/4 timeslot (~433 microseconds)
. . .
1 1 1 1 16/4 timeslot (~2307 microseconds)

SM_VALUE (Switch-Measure) (4 bit field)
The SM field indicates the time needed for the mobile station to switch from one radio channel to another and perform a neighbour cell power measurement.
Bits
4 3 2 1
0 0 0 0 1/4 timeslot (~144 microseconds)
0 0 0 1 2/4 timeslot (~288 microseconds)
0 0 1 0 3/4 timeslot (~433 microseconds)
. . .
1 1 1 1 16/4 timeslot (~2307 microseconds)

MS Positioning Method Capability (1 bit field)
This bit indicates whether the MS supports Positioning Method or not for the provision of Location Services.

MS Positioning Method (5 bit field)
This field indicates the Positioning Method(s) supported by the mobile station.
MS assisted E-OTD
Bit 5
0 MS assisted E-OTD not supported
1 MS assisted E-OTD supported

Table 10.5.1.7/3GPP TS 24.008 (continued): *MS Classmark 3* information element

MS based E-OTD
Bit 4
0 MS based E-OTD not supported
1 MS based E-OTD supported

MS assisted GPS
Bit 3
0 MS assisted GPS not supported
1 MS assisted GPS supported

MS based GPS
Bit 2
0 MS based GPS not supported
1 MS based GPS supported

MS conventional GPS
Bit 1
0 conventional GPS not supported
1 conventional GPS supported

EDGE Multi Slot class (5 bit field)

In case the EDGE MS supports the use of multiple timeslots and the number of supported time slots is different from number of time slots supported for GMSK then the EDGE Multi Slot class field is included and is coded as the binary representation of the multislot class defined in 3GPP TS ~~GSM~~ 05.02.

Modulation Capability

Modulation Capability field indicates the supported modulation scheme by MS in addition to GMSK
Bit 1
0 8-PSK supported for downlink reception only
1 8-PSK supported for uplink transmission and downlink reception

EDGE RF Power Capability 1 (2 bit field)

If 8-PSK modulation is supported for both uplink and downlink, the **EDGE RF Power Capability 1** field indicates the radio capability for 8-PSK modulation in GSM400, GSM850 or GSM900.

EDGE RF Power Capability 2 (2 bit field)

If 8-PSK modulation is supported for both uplink and downlink, the **EDGE RF Power Capability 2** field indicates the radio capability for 8-PSK modulation in DCS1800 or PCS1900 if supported, and is not included otherwise.

The respective **EDGE RF Power Capability 1** and **EDGE RF Power Capability 2** fields contain the following coding of the 8-PSK modulation power class (see 3GPP TS 05.05) :
Bits 2 1
0 0 Reserved
0 1 Power class E1
1 0 Power class E2
1 1 Power class E3

Table 10.5.1.7/3GPP TS 24.008 (continued): *MS Classmark 3* information element

GSM 400 Bands Supported (2 bit field)
See the semantic rule for the sending of this field.
Bits
2 1
0 1 GSM 480 supported, GSM 450 not supported
1 0 GSM 450 supported, GSM 480 not supported
1 1 GSM 450 supported, GSM 480 supported

GSM 400 Associated Radio Capability (4 bit field)
If either GSM 450 or GSM 480 or both is supported, the GSM 400 Associated Radio Capability field indicates the radio capability for GSM 450 and/or GSM 480.

The radio capability contains the binary coding of the power class associated with the band indicated in GSM 400 Bands Supported bits (see ~~GSM~~3GPP TS 05.05).

Note: the coding of the power class for GSM 450 and GSM 480 in GSM 400 Associated Radio Capability is different to that used in the Mobile Station Classmark 1 and Mobile Station Classmark 2 information elements.

GSM 850 Associated Radio Capability (4 bit field)

See the semantic rule for the sending of this field.This field indicates whether GSM 850 band is supported and its associated radio capability.

The radio capability contains the binary coding of the power class associated with the GSM 850 band (see ~~GSM~~3GPP TS 05.05).

Note: the coding of the power class for GSM 850 in GSM 850 Associated Radio Capability is different to that used in the Mobile Station Classmark 1 and Mobile Station Classmark 2 information elements.

PCS 1900 Associated Radio Capability (4 bit field)

See the semantic rule for the sending of this field.This field indicates whether PCS 1900 band is supported and its associated radio capability.

The radio capability contains the binary coding of the power class associated with the PCS 1900 band (see ~~GSM~~3GPP TS 05.05).

Note: the coding of the power class for PCS 1900 in PCS 1900 Associated Radio Capability is different to that used in the Mobile Station Classmark 1 and Mobile Station Classmark 2 information elements.

Table 10.5.1.7/3GPP TS 24.008 (continued): *MS Classmark 3* information element

UMTS FDD Radio Access Technology Capability (1 bit field)
Bit 1
0 UMTS FDD not supported
1 UMTS FDD supported

UMTS TDD Radio Access Technology Capability (1 bit field)
Bit 1
0 UMTS TDD not supported
1 UMTS TDD supported

CDMA 2000 Radio Access Technology Capability (1 bit field)
Bit 1
0 CDMA2000 not supported
1 CDMA2000 supported

DTM GPRS Multi Slot Sub-Class (2 bit field)
This field indicates the GPRS DTM capabilities of the MS. The DTM GPRS Multi Slot Sub-Class is independent from the Multi Slot Capabilities field. It is coded as follows:

Bit 2 1
0 0 Sub-Class 1 supported
0 1 Sub-Class 5 supported
1 0 Sub-Class 9 supported
1 1 Reserved for future extension. If received, the network shall interpret this as '00'

DTM EGPRS Multi Slot Sub-Class (2 bit field)
This field indicates the EGPRS DTM capabilities of the MS. The DTM EGPRS Multi Slot Sub-Class is independent from the Multi Slot Capabilities field. This field shall be included only if the mobile station supports EGPRS DTM. This field is coded as the DTM GPRS Multi Slot Sub-Class field.

MAC Mode Support (1 bit field)
This field indicates whether the MS supports Dynamic and Fixed Allocation or only supports Exclusive Allocation. It is coded as follows:

Bit 1
0 Dynamic and Fixed Allocation not supported
1 Dynamic and Fixed allocation supported

Single Band Support

This field shall be sent if the mobile station supports UMTS and one and only one GSM band with the exception of R-GSM; this field shall not be sent otherwise.

GSMBand (4 bit field)
Bits
4 3 2 1
0 0 0 0 E-GSM is supported
0 0 0 1 P-GSM is supported
0 0 1 0 DCS 1800 is supported
0 0 1 1 GSM 450 is supported
0 1 0 0 GSM 480 is supported
0 1 0 1 GSM 850 is supported
0 1 1 0 PCS 1900 is supported
All other values are reserved for future use.

NOTE: When this field is received, the associated RF Power capability is found in Classmark1 or 2.

10.5.1.9 Descriptive group or broadcast call reference

The purpose of the *Descriptive Group or Broadcast Call Reference* is to provide information describing a voice group or broadcast call. The IE of the *Descriptive Group or Broadcast Call Reference* is composed of the group or broadcast call reference together with a service flag, an acknowledgement flag, the call priority and the group cipher key number.

The *Descriptive Group or Broadcast Call Reference* information element is coded as shown in figure 10.5.8/3GPP TS 24.008 and Table10.5.8/3GPP TS 24.008

The *Descriptive Group or Broadcast Call Reference* is a type 3 information element with 6 octets length.

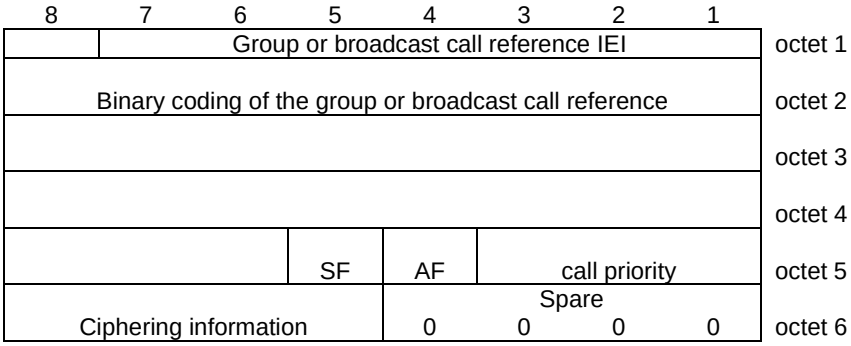

Figure 10.5.8/3GPP TS 24.008 Descriptive Group or Broadcast Call Reference

Table 10.5.8/3GPP TS 24.008 Descriptive Group or Broadcast Call Reference

Binary code of the group or broadcast call reference
The length of the binary code has 27 bits which is encoded in the octet 2, 3, 4 and Bits 8,7,6 (octet 5).
The highest bit of the BC is the bit 8 in the octet 2 and the lowest bit is allocated in the bit 6 in the octet 5. (see also ~~GSM~~3GPP TS ~~03.03~~23.003)
SF Service flag (octet 5)
Bit
5
0 VBS (broadcast call reference)
1 VGCS (group call reference)

AF Acknowledgement flag (octet 5)
Bit
4
0 acknowledgement is not required
1 acknowledgement is required

Call priority (octet 5)
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

Ciphering information (octet 6)
Bit

8	**7**	**6**	**5**	
0	0	0	0	no ciphering
0	0	0	1	ciphering with cipher key number 1
0	0	1	0	ciphering with cipher key number 2
0	0	1	1	ciphering with cipher key number 3
0	1	0	0	ciphering with cipher key number 4
0	1	0	1	ciphering with cipher key number 5
0	1	1	0	ciphering with cipher key number 6
0	1	1	1	ciphering with cipher key number 7
1	0	0	0	ciphering with cipher key number 8
1	0	0	1	ciphering with cipher key number 9
1	0	1	0	ciphering with cipher key number A
1	0	1	1	ciphering with cipher key number B
1	1	0	0	ciphering with cipher key number C
1	1	0	1	ciphering with cipher key number D
1	1	1	0	ciphering with cipher key number E
1	1	1	1	ciphering with cipher key number F

10.5.1.10a PD and SAPI $(CCBS)$

The purpose of the *PD and SAPI* information element is to provide information concerning Protocol Discriminators and Service Access Point Identifiers.

The *PD and SAPI* information element is coded as shown in figure 10.5.10/3GPP TS 24.008 and table 10.5.10/3GPP TS 24.008.

The *PD and SAPI* is a type 3 information element with 2 octets length.

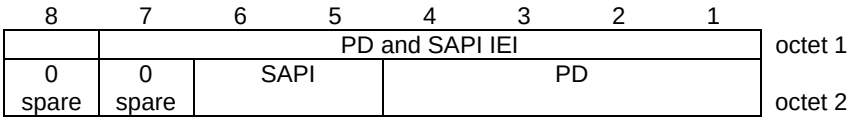

Figure10.5.10/3GPP TS 24.008
***PD and SAPI* information element**

Table 10.5.1.10/3GPP TS 24.008: *PD and SAPI* information element

SAPI: Service Access Point Identifier (octet 2)

Bits

6	**5**	
0	0	SAPI 0
0	1	reserved
1	0	reserved
1	1	SAPI 3

PD: Protocol Discriminator (octet 2)
bits 4-1
Encoded as specified in clause 11.2.1 of 3GPP TS ~~04.07~~24.007.

10.5.3.5a Network Name

The purpose of this information element is to pass a text string to the mobile station.

The *Network Name* information element is coded as shown in figure 10.5.80/3GPP TS 24.008 and table 10.5.94/3GPP TS 24.008.

The *Network Name* is a type 4 information element with a minimum length of 3 octets. No upper length limit is specified except for that given by the maximum number of octets in a L3 message (see ~~GSM~~3GPP TS 04.06).

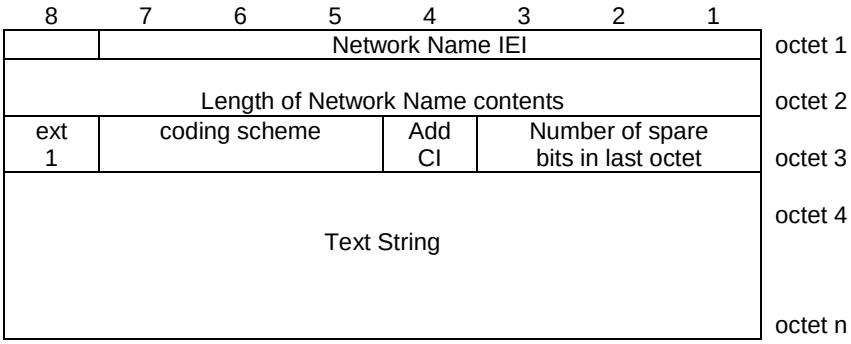

Figure 10.5.80/3GPP TS 24.008 *Network Name* information element

Table 10.5.94/3GPP TS 24.008 *Network Name* information element

Number of spare bits in last octet (octet 3, bits 1 to 3) **2 1** 0 0 1 bit 8 is spare and set to "0" in octet n 0 1 0 bits 7 and 8 are spare and set to "0" in octet n 0 1 1 bits 6 to 8(inclusive) are spare and set to "0" in octet n 1 0 0 bits 5 to 8(inclusive) are spare and set to "0" in octet n 1 0 1 bits 4 to 8(inclusive) are spare and set to "0" in octet n 1 1 0 bits 3 to 8(inclusive) are spare and set to "0" in octet n 1 1 1 bits 2 to 8(inclusive) are spare and set to "0" in octet n 0 0 0 this field carries no information about the number of spare bits in octet n Add CI (octet 3, bit 4) 0 The MS should not add the letters for the Country's Initials to the text string 1 The MS should add the letters for the Country's Initials and a separator (e.g. a space) to the text string Coding Scheme (octet 3, bits 5-7) 0 0 0 Cell Broadcast data coding scheme, GSM default alphabet, language unspecified, defined in ~~GSM~~3GPP TS ~~03.38~~23.038 [8b] 0 0 1 UCS2 (16 bit) [72] 0 1 0 to reserved 1 1 1 Text String (octet 4 to octet n, inclusive) Encoded according to the Coding Scheme defined by octet 3, bits 5-7

10.5.3.8 Time Zone

The purpose of this information element is to encode the offset between universal time and local timein steps of 15 minutes.

The *Time Zone* information element is coded as shown in figure 10.5.83/3GPP TS 24.008 and table 10.5.96/3GPP TS 24.008.

The *Time Zone* is a type 3 information element with a length of 2 octets.

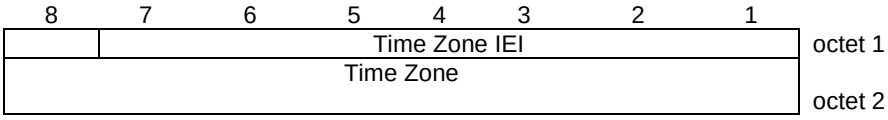

Figure 10.5.83/3GPP TS 24.008 *Time Zone* information element

Table 10.5.96/3GPP TS 24.008 *Time Zone* information element

Time Zone (octet 2, bits 1-8) This field uses the same format as the Timezone field used in the TP-Service-Centre-Time-Stamp, which is defined in ~~GSM~~3GPP TS ~~03.40~~23.040, and its value shall be set as defined in ~~GSM~~3GPP TS ~~02.42~~22.042

10.5.3.9 Time Zone and Time

The purpose of the timezone part of this information element is to encode the offset between universal time and local time in steps of 15 minutes.

The purpose of the time part of this information element is to encode the universal time at which this information element may have been sent by the network.

The *Time Zone and Time* information element is coded as shown in figure 10.5.84/3GPP TS 24.008 and table 10.5.97/3GPP TS 24.008.

The *Time Zone and Time* is a type 3 information element with a length of 8 octets.

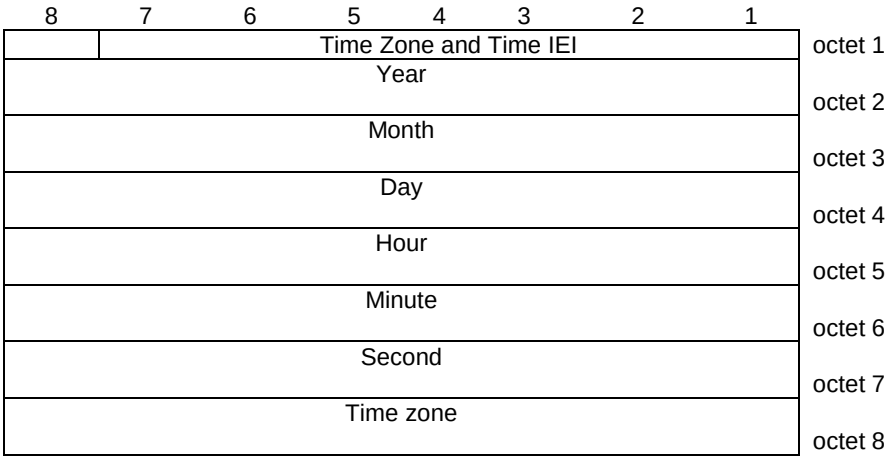

Figure 10.5.84/3GPP TS 24.008 *Time Zone and Time* information element

Table 10.5.97/3GPP TS 24.008 *Timezone and Time* information element

Year (octet 2, bits 1-8) This field uses the same format as the Year field used in the TP-Service-Centre-Time-Stamp, which is defined in ~~GSM~~3GPP TS ~~03.40~~23.040, and its value shall be set as defined in ~~GSM~~3GPP TS ~~02.42~~22.042 Month (octet 3, bits 1-8) This field uses the same format as the Month field used in the TP-Service-Centre-Time-Stamp, which is defined in ~~GSM~~3GPP TS ~~03.40~~23.040, and its value shall be set as defined in ~~GSM~~3GPP TS ~~02.42~~22.042. Day (octet 4, bits 1-8) This field uses the same format as the Day field used in the TP-Service-Centre-Time-Stamp, which is defined in ~~GSM~~3GPP TS ~~03.40~~23.040, and its value shall be set as defined in ~~GSM~~3GPP TS ~~02.42~~22.042. Hour (octet 5, bits 1-8) This field uses the same format as the Hour field used in the TP-Service-Centre-Time-Stamp, which is defined in ~~GSM~~3GPP TS ~~03.40~~23.040, and its value shall be set as defined in ~~GSM~~3GPP TS ~~02.42~~22.042. Minute (octet 6, bits 1-8) This field uses the same format as the Minute field used in the TP-Service-Centre-Time-Stamp, which is defined in ~~GSM~~3GPP TS ~~03.40~~23.040, and its value shall be set as defined in ~~GSM~~3GPP TS ~~02.42~~22.042. Second (octet 7, bits 1-8) This field uses the same format as the Second field used in the TP-Service-Centre-Time-Stamp, which is defined in ~~GSM~~3GPP TS ~~03.40~~23.040, and its value shall be set as defined in ~~GSM~~3GPP TS ~~02.42~~22.042. Time Zone (octet 8, bits 1-8) This field uses the same format as the Time Zone field used in the TP-Service-Centre-Time-Stamp, which is defined in ~~GSM~~3GPP TS ~~03.40~~23.040, and its value shall be set as defined in ~~GSM~~3GPP TS ~~02.42~~22.042

NOTE: Due to ambiguities in earlier versions of the protocol specifications, some mobile stations may interpret the received NITZ time as local time. This may result in incorrect time settings in the mobile.

10.5.4.3 Non-locking shift procedure

The non-locking shift procedure provides a temporary shift to the specified lower or higher codeset. The non-locking shift procedure uses a type 1 information element to indicate the codeset to be used to interpret the next information element. After the interpretation of the next information element, the active codeset is again used for interpreting any following information elements. For example, codeset 0 is active at the beginning of message content analysis. If a non-locking shift to codeset 6 is encountered, only the next information element is interpreted according to the information element identifiers assigned in codeset 6. After this information element is interpreted, codeset 0 will again be used to interpret the following information elements. A non-locking shift information element indicating the current codeset shall not be regarded as an error.

A locking shift information element shall not follow directly a non-locking shift information element. If this combination is received, it shall be interpreted as though a locking shift information element had been received.

The non-locking shift information element uses the type 1 information format and coding shown in figure 10.5.86/3GPP TS 24.008 and table 10.5.99/3GPP TS 24.008.

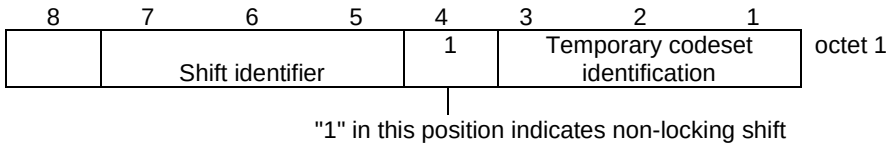

Figure 10.5.86/3GPP TS 24.008 Non-locking shift element

Table 10.5.99/3GPP TS 24.008: Non-locking shift element

Codeset identification (octet 1):				
Bits				
3	**2**	**1**		
0	0	0	codeset 0 (initially active):	
			~~GSM~~3GPP TS 24.008 information elements	
0	0	1	}	
to			} reserved	
1	0	0	}	
1	0	1	codeset 5:	information elements for national use
1	1	0	codeset 6:	information elements specific to the local network (either public or private)
1	1	1	codeset 7:	user-specific information elements

10.5.4.4 Auxiliary states

The purpose of the auxiliary states information element is to describe the current status of the auxiliary states of a call in the call control states "active" and "mobile originating modify". (See 3GPP TSs 3GPP TS 24.083 and ~~04.8~~24.084)

The auxiliary states information element is coded as shown in figure 10.5.87/3GPP TS 24.008, table 10.5.100/3GPP TS 24.008 and table 10.5.101/3GPP TS 24.008.

The auxiliary states is a type 4 information element with 3 octets length.

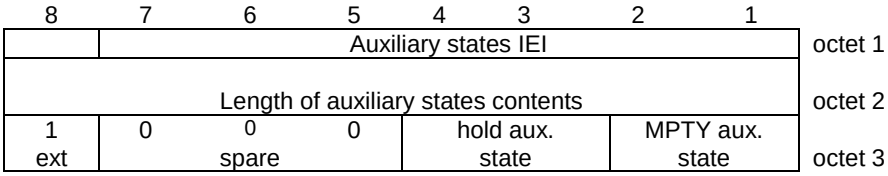

Figure 10.5.87/3GPP TS 24.008 Auxiliary states information element

Table 10.5.100/3GPP TS 24.008: Auxiliary states information element

Hold auxiliary state (octet 3)			
Bits			
4	**3**		
0	0	idle	Note 1
0	1	hold request	Note 1
1	0	call held	Note 1
1	1	retrieve request	Note 1
Note 1: These states are defined in ~~Rec GSM~~3GPP TS ~~04.8~~24.083.			

Table 10.5.101/3GPP TS 24.008: Auxiliary states information element

Multi party auxiliary state (octet 3)			
Bits			
2	**1**		
0	0	idle	Note 2
0	1	MPTY request	Note 2
1	0	call in MPTY	Note 2
1	1	split request	Note 2
Note 2: These states are defined in ~~Rec GSM~~3GPP TS ~~04.8~~24.084.			

10.5.4.5 Bearer capability

The purpose of the bearer capability information element is to describe a bearer service. The use of the bearer capability information element in relation to compatibility checking is described in annex B.

The bearer capability information element is coded as shown in figure 10.5.88/3GPP TS 24.008 and tables 10.5.102/3GPP TS 24.008 to 10.5.115/3GPP TS 24.008.

The bearer capability is a type 4 information element with a minimum length of 3 octets and a maximum length of 16 octets.

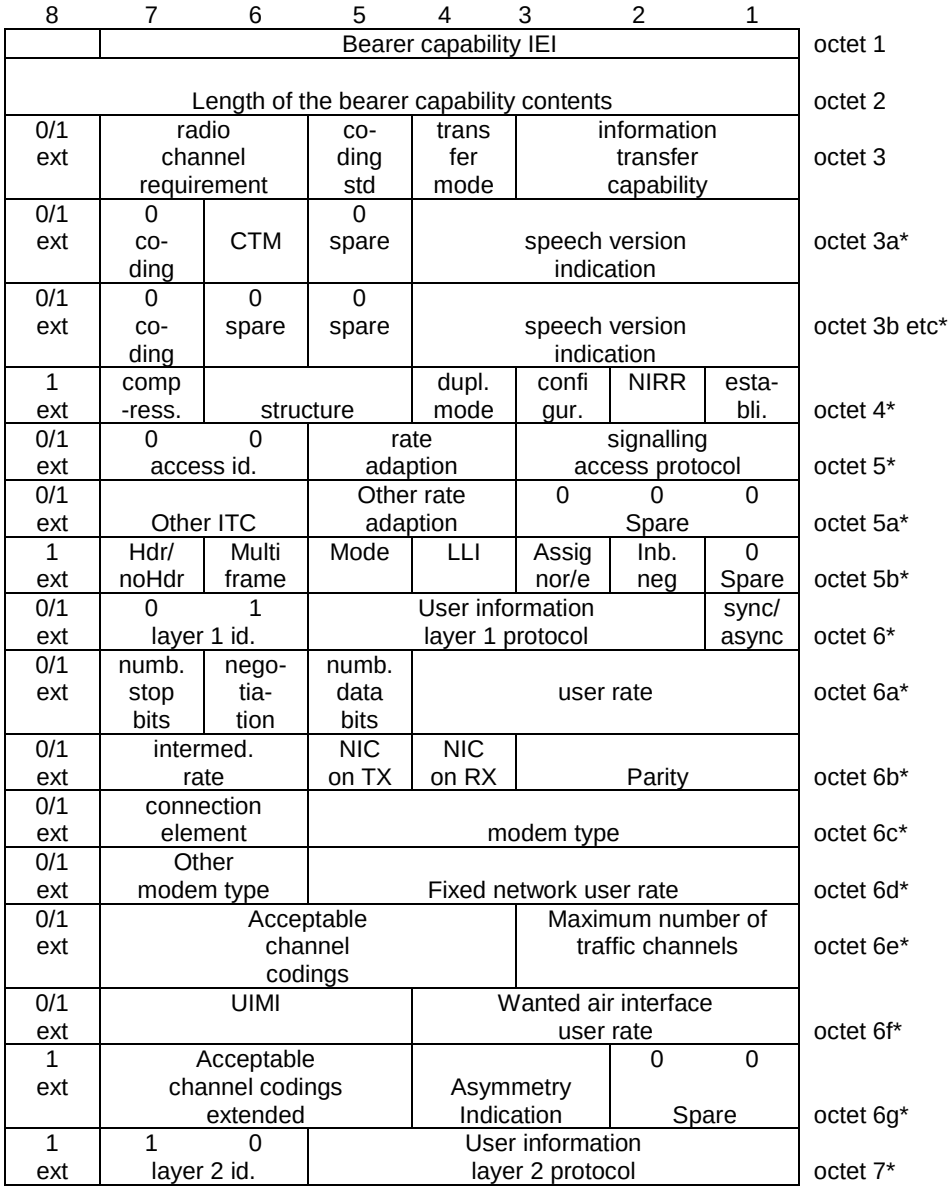

Figure 10.5.88/3GPP TS 24.008 Bearer capability information element

NOTEs 1: The coding of the octets of the bearer capability information element is not conforming to ITU Q.931.

NOTE 2: An MS shall encode the Bearer Capability infomation element according to GSM call control requirements also if it is requesting for a UMTS service.

NOTE 3: For UTRAN access the following parameter is irrelevant, because multiple traffic channels (multislot) are not deployed [3GPP TS 23.034]. The parameter shall, however, be stored in MSC, and forwarded at handover:

- UIMI, User initiated modification indication (octet 6f, bits 5-7)

NOTE 4: The following parameters are relevant in UMTS for non transparent data calls for deciding which RLP version to negotiate in order to avoid renegotiation of RLP version in case of inter-system handover, see 3GPP TS 24.022 [9]. They are otherwise irrelevant for specifying the UTRAN radio access bearer:

- Maximum number of traffic channels (octet 6e, bits 1-3)
- Acceptable Channel coding(s) (octet 6e, bits 4, 5 and 7)
- Acceptable Channel Codings extended (octet 6g, bits 5-7).

NOTE 5: A mobile station not supporting GSM shall set the following parameters to the value "0":

- Maximum number of traffic channels (octet 6e, bits 1-3)
- Acceptable Channel coding(s) (octet 6e, bits 4, 5 and 7)
- UIMI, User initiated modification indication (octet 6f, bits 5-7)
- Acceptable Channel Codings extended (octet 6g, bits 5-7).

10.5.4.7 Called party BCD number

The purpose of the called party BCD number information element is to identify the called party.

The called party BCD number information element is coded as shown in figure 10.5.91/3GPP TS 24.008 and table 10.5.118/3GPP TS 24.008.

The called party BCD number is a type 4 information element with a minimum length of 3 octets and a maximum length of 43 octets. For PCS 1900 the maximum length is 19 octets.

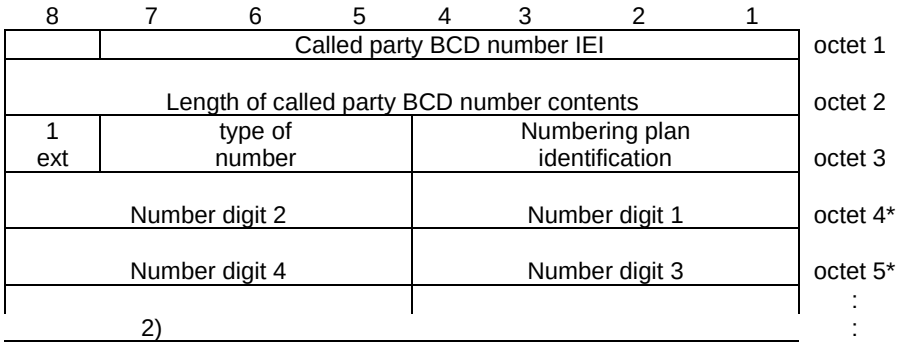

Figure 10.5.91/3GPP TS 24.008 Called party BCD number information element

NOTE 1: The number digit(s) in octet 4 precedes the digit(s) in octet 5 etc. The number digit which would be entered first is located in octet 4, bits 1 to 4.

NOTE 2: If the called party BCD number contains an odd number of digits, bits 5 to 8 of the last octet shall be filled with an end mark coded as "1111".

Since the information element must contain the complete called party BCD number there is no need for an additional complete indication.

Table 10.5.118/3GPP TS 24.008: Called party BCD number

Type of number (octet 3) (Note 1)

Bits

7	6	5	
0	0	0	unknown (Note 2)
0	0	1	international number (Note 3, Note 5)
0	1	0	national number (Note 3)
0	1	1	network specific number (Note 4)
1	0	0	dedicated access, short code
1	0	1	reserved
1	1	0	reserved
1	1	1	reserved for extension

NOTE 1: For the definition of "number" see ITU-T Recommendation I.330 and 3GPP TS 23.003.

NOTE 2: The type of number "unknown" is used when the user or the network has no knowledge of the type of number, e.g. international number, national number, etc. In this case the number digits field is organized according to the network dialling plan, e.g. prefix or escape digits might be present.

NOTE 3: Prefix or escape digits shall not be included.

NOTE 4: The type of number "network specific number" is used to indicate administration/service number specific to the serving network, e.g. used to access an operator.

NOTE 5: The international format shall be accepted by the MSC when the call is destined to a destination in the same country as the MSC.

Table 10.5.118/3GPP TS 24.008: Called party BCD number (continued)

Numbering plan identification (octet 3)

Number plan (applies for type of number = 000, 001, 010 and 100)

Bits

4	3	2	1	
0	0	0	0	unknown
0	0	0	1	ISDN/telephony numbering plan (Rec. E.164/E.163)
0	0	1	1	data numbering plan (Recommendation X.121)
0	1	0	0	telex numbering plan (Recommendation F.69)
1	0	0	0	national numbering plan
1	0	0	1	private numbering plan
1	0	1	1	reserved for CTS (see ~~GSM~~3GPP TS 04.56)
1	1	1	1	reserved for extension

All other values are reserved.

When an MS is the recipient of number information from the network, any incompatibility between the number digits and the number plan identification shall be ignored and a STATUS message shall not be sent to the network.

In the case of numbering plan "unknown", the number digits field is organized according to the network dialling plan; e.g. prefix or escape digits might be present.

Table 10.5.118/3GPP TS 24.008: Called party BCD number (continued)

Number digits (octets 4, etc.)					
Bits					Number digit value
4	**3**	**2**	**1**	or	
8	**7**	**6**	**5**		
0	0	0	0		0
0	0	0	1		1
0	0	1	0		2
0	0	1	1		3
0	1	0	0		4
0	1	0	1		5
0	1	1	0		6
0	1	1	1		7
1	0	0	0		8
1	0	0	1		9
1	0	1	0		*
1	0	1	1		#
1	1	0	0		a
1	1	0	1		b
1	1	1	0		c
1	1	1	1		used as an endmark in the case of an odd number of number digits

10.5.4.11 Cause

The purpose of the cause information element is to describe the reason for generating certain messages, to provide diagnostic information in the event of procedural errors and to indicate the location of the cause originator.

The cause information element is coded as shown in figure 10.5.95/3GPP TS 24.008 and tables 10.5.122 and 10.5.123/3GPP TS 24.008.

The cause is a type 4 information element with a minimum length of 4 octets and a maximum length of 32 octets.

The cause information element may be repeated in a message.

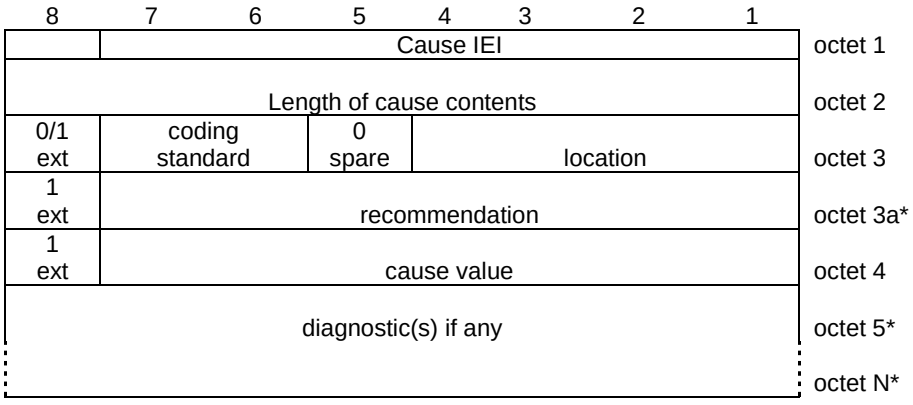

Figure 10.5.95/3GPP TS 24.008 Cause information element

If the default value applies for the recommendation field, octet 3a shall be omitted.

Table 10.5.122/3GPP TS 24.008: Cause information element

Coding standard (octet 3)
Bits

7	**6**	
0	0	Coding as specified in ITU-T Rec. Q.931
0	1	Reserved for other international standards
1	0	National standard
1	1	Standard defined for the GSM~~ß~~ PLMNS as described below and in table 10.86/~~GSM~~3GPP TS 24.008

Coding standards other than "1 1 - Standard defined for the GSM PLMNS" shall not be used if the cause can be represented with the GSM standardized coding.

The mobile station or network need not support any other coding standard than "1 1 - Standard defined for the GSM PLMNS".
If a cause IE indicating a coding standard not supported by the receiver is received, cause "interworking, unspecified" shall be assumed.

Location (octet 3)
Bits

4	**3**	**2**	**1**	
0	0	0	0	user
0	0	0	1	private network serving the local user
0	0	1	0	public network serving the local user
0	0	1	1	transit network
0	1	0	0	public network serving the remote user
0	1	0	1	private network serving the remote user
0	1	1	1	international network
1	0	1	0	network beyond interworking point

All other values are reserved.

Recommendation (octet 3a)
Octet 3a shall not be included if the coding standard is coded as "1 1 - Standard defined for GSM PLMNS".

If the coding standard is different from "1 1 - Standard defined for GSM PLMNS", the coding of octet 3a, if included, and octets 4 to N is according to that coding standard.

Table 10.5.122/3GPP TS 24.008: Cause information element (continued)

Cause value (octet 4) The cause value is divided in two fields: a class (bits 5 through 7) and a value within the class (bits 1 through 4). The class indicates the general nature of the event. Class (000): normal event Class (001): normal event Class (010): resource unavailable Class (011): service or option not available Class (100): service or option not implemented Class (101): invalid message (e.g. parameter out of range) Class (110): protocol error (e.g. unknown message) Class (111): interworking The cause values are listed in Table 10.86/~~GSM~~3GPP TS~~ 8~~ 24.008 below and defined in Annex H. Diagnostic(s) (octet 5) Diagnostic information is not available for every cause, see Table 10.86/~~GSM~~3GPP TS 24.008 below. When available, the diagnostic(s) is coded in the same way as the corresponding information element in clause 10. The inclusion of diagnostic(s) is optional.

10.5.4.15 Facility

The purpose of the facility information element is to transport supplementary service related information. Within the scope of 3GPP TS 24.008 the content of the Facility information field is an array of octets. The usage of this transportation mechanism is defined in 3GPP TS 24.080.

The facility information element is coded as shown in figure 10.5.101/3GPP TS 24.008

The facility is a type 4 information element with a minimum length of 2 octets. No upper length limit is specified except for that given by the maximum number of octets in a L3 message (see ~~GSM~~3GPP TS 04.06).

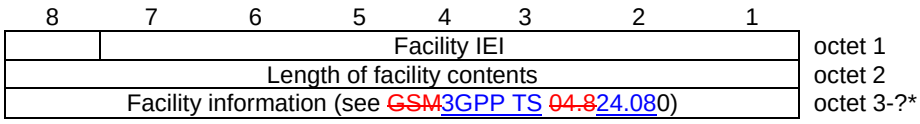

Figure 10.5.101/3GPP TS 24.008

10.5.4.21 Progress indicator

The purpose of the progress indicator information element is to describe an event which has occurred during the life of a call.

The progress indicator information element is coded as shown in figure 10.5.107/3GPP TS 24.008 and table 10.5.127/3GPP TS 24.008.

The progress indicator is a type 4 information element with a length of 4 octets.

8	7	6	5	4	3	2	1	
	Progress indicator IEI							octet 1
Length of progress indicator contents								octet 2
1 ext	coding standard		0 spare		location			octet 3
1 ext	progress description							octet 4

Figure 10.5.107/3GPP TS 24.008 Progress indicator information element

Table 10.5.127/3GPP TS 24.008: Progress indicator information element

Coding standard (octet 3)
Bits

7	**6**	
0	0	Standardized coding, as described in ITU-T Rec. Q.931
0	1	Reserved for other international standards
1	0	National standard
1	1	Standard defined for the GSM~~/~~ PLMNS as described below

Coding standards other than "1 1 - Standard defined for the GSM PLMNS" shall not be used if the progress description can be represented with the GSM~~/~~ standardized coding.

The mobile station or network need not support any other coding standard than "1 1 - Standard defined for the GSM PLMNS".
If a progress indicator IE indicating a coding standard not supported by the receiver is received, progress description "Unspecific" shall be assumed.

Location (octet 3)
Bits

4	**3**	**2**	**1**	
0	0	0	0	User
0	0	0	1	Private network serving the local user
0	0	1	0	Public network serving the local user
0	1	0	0	Public network serving the remote user
0	1	0	1	Private network serving the remote user
1	0	1	0	Network beyond interworking point

All other values are reserved.

Note: Depending on the location of the users, the local public network and remote public network may be the same network.

Progress description (octet 4)
Bits

7	**6**	**5**	**4**	**3**	**2**	**1**	No.	
0	0	0	0	0	0	1	1.	Call is not end-to-end PLMN/ISDN, further call progress information may be available in-band
0	0	0	0	0	1	0	2.	Destination address in non-PLMN/ISDN
0	0	0	0	0	1	1	3.	Origination address in non-PLMN/ISDN
0	0	0	0	1	0	0	4.	Call has returned to the PLMN/ISDN
0	0	0	1	0	0	0	8.	In-band information or appropriate pattern now available
0	1	0	0	0	0	0	32.	Call is end-to-end PLMN/ISDN
1	0	0	0	0	0	0	64.	Queueing
All other values								Unspecific

10.5.4.22b SETUP Container $(CCBS)$

This information element contains the contents of a SETUP message (Mobile Station to Network). This means that the Call Control protocol discriminator IE, the Transaction Identifier IE and the Setup message type IE are not included.

The SETUP Container information element is coded as shown in figure 10.5.111/3GPP TS 24.008

The SETUP Container is a type 4 information. No upper length limit is specified except for that given by the maximum number of octets in a L3 message (see ~~GSM~~3GPP TS 04.06).

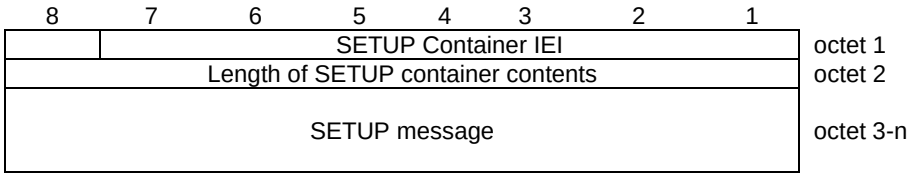

Figure 10.5.111/3GPP TS 24.008 Octet j (j = 3, 4 ... n) is the unchanged octet j of the SETUP message.

10.5.4.24 SS Version Indicator

The purpose of the SS version indicator information element is to aid the decoding of the Facility information element as described in 3GPP TS 24.010. Within the scope of 3GPP TS 24.008 the contents of the SS Version information field is an array of one or more octets. The usage of the SS version information field is defined in 3GPP TS 24.080.

The SS version indicator information element is coded as shown in figure 10.5.113/3GPP TS 24.008

The SS version indicator is a type 4 information element with a minimum length of 2 octets. No upper length limit is specified except for that given by the maximum number of octets in a L3 message (see ~~GSM~~3GPP TS 04.06).

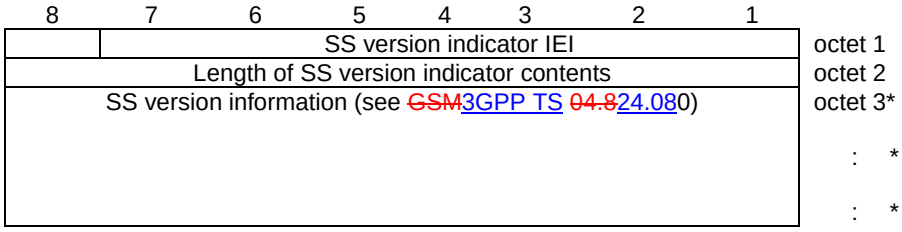

Figure 10.5.113/3GPP TS 24.008

NOTE: Usually, this information element has only one octet of content.

10.5.4.26 Alerting Pattern (NIA)

The purpose of the Alerting Pattern information element is to allow the network to convey information related to the alert to be used by the MS (see ~~GSM~~3GPP TS ~~02.07~~22.101 [8]).

The Alerting Pattern information element is coded as shown in figure 10.5.115/3GPP TS 24.008 and table 10.5.132/3GPP TS 24.008.

The Alerting Pattern IE is a type 4 information element with 3 octet length.

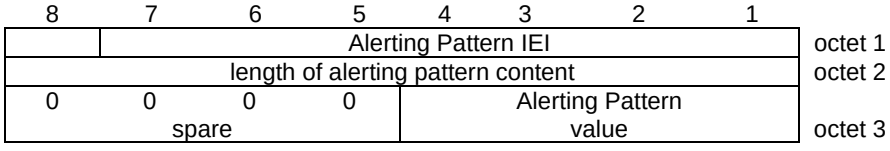

Figure 10.5.115/3GPP TS 24.008 Alerting Pattern information element

Table 10.5.132/3GPP TS 24.008: Alerting Pattern information element

Alerting Pattern value (octet 3) Bits **4 3 2 1**	
0 0 0 0	alerting pattern 1
0 0 0 1	alerting pattern 2
0 0 1 0	alerting pattern 3
0 1 0 0	alerting pattern 5
0 1 0 1	alerting pattern 6
0 1 1 0	alerting pattern 7
0 1 1 1	alerting pattern 8
1 0 0 0	alerting pattern 9
all other values are reserved	

Alerting pattern 1, 2 and 3 indicate alerting levels 0, 1 and 2.

Alerting pattern 5 to 9 indicate alerting categories 1 to 5

10.5.5.4 TMSI status

The purpose of the *TMSI status* information element is to indicate whether a valid TMSI is available in the MS or not.

The *TMSI status* is a type 1 information element.

The *TMSI status* information element is coded as shown in figure 10.5.120/~~GSM~~3GPP TS ~~04.08~~24.008 and table 10.5.137/~~GSM~~3GPP TS ~~04.08~~24.008.

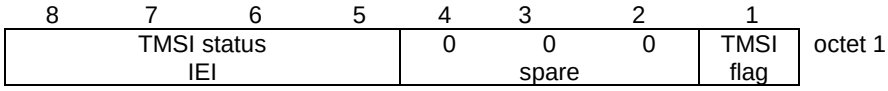

Figure 10.5.120/~~GSM~~3GPP TS ~~04.08~~24.008: *TMSI status* information element

Table 10.5.137/~~GSM~~3GPP TS ~~04.08~~24.008: *TMSI status* information element

TMSI flag (octet 1) Bit **1**	
0	no valid TMSI available
1	valid TMSI available

10.5.5.12 MS network capability

The purpose of the *MS network capability* information element is to provide the network with information concerning aspects of the mobile station related to GPRS. The contents might affect the manner in which the network handles the operation of the mobile station. The *MS network capability* information indicates general mobile station characteristics and it shall therefore, except for fields explicitly indicated, be independent of the frequency band of the channel it is sent on.

The *MS network capability* is a type 4 information element with a maximum of 10 octets length.

The value part of a *MS network capability*information element is coded as shown in figure 10.5.128/3GPP TS 24.008 and table 10.5.145/3GPP TS 24.008.

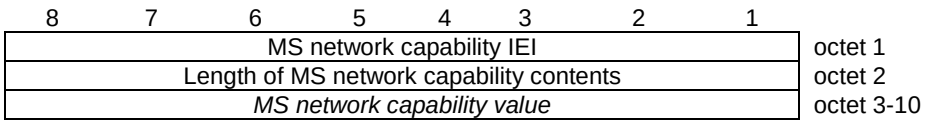

Figure 10.5.128/3GPP TS 24.008 MS network capability information element

Table 10.5.145/3GPP TS 24.008 *MS network capability* information element

<MS network capability value part> ::=

<**GEA1 bits**>
<**SM capabilities via dedicated channels**: bit>
<**SM capabilities via GPRS channels**: bit>
<**UCS2 support**: bit>
<**SS Screening Indicator**: bit string(2)>
<SoLSA Capability : bit>
<Revision level indicator: bit>
<PFC feature mode: bit>
<Extended GEA bits>
<Spare bits>;

<GEA1 bits> ::= < **GEA/1** :bit>;

<Extended GEA bits> ::= <GEA/2:bit><GEA/3:bit>< GEA/4:bit >< GEA/5:bit >< GEA/6:bit ><GEA/7:bit>;

<**Spare bits**> ::= null | {<spare bit> < **Spare bits** >};

SS Screening Indicator
0 0 defined in 3GPP TS 24.080

0 1 defined in 3GPP TS 24.080
1 0 defined in 3GPP TS 24.080
1 1 defined in 3GPP TS 24.080

SM capabilities via dedicated channels
0 Mobile station does not support mobile terminated point to point SMS via dedicated signalling channels
1 Mobile station supports mobile terminated point to point SMS via dedicated signalling channels

SM capabilities via GPRS channels
0 Mobile station does not support mobile terminated point to point SMS via GPRS packet data channels
1 Mobile station supports mobile terminated point to point SMS via GPRS packet data channels

UCS2 support
This information field indicates the likely treatment by the mobile station of UCS2 encoded character strings.
0 the ME has a preference for the default alphabet (defined in ~~GSM~~3GPP TS ~~03.38~~23.038 [8b]) over UCS2.
1 the ME has no preference between the use of the default alphabet and the use of UCS2.

GPRS Encryption Algorithm GEA/1
0 encryption algorithm **GEA/1**not available
1 encryption algorithm **GEA/1** available

SoLSA Capability
0 The ME does not support SoLSA.
1 The ME supports SoLSA.

Revision level indicator
0 used by a mobile station not supporting R99 or later versions of the protocol
1 used by a mobile station supporting R99 or later version of the protocol

PFC feature mode
0 Mobile station does not support BSS packet flow procedures
1 Mobile station does support BSS packet flow procedures

GEA/2
0 encryption algorithm GEA/2 not available

1 encryption algorithm GEA/2 available

GEA/3
0 encryption algorithm GEA/3 not available
1 encryption algorithm GEA/3 available

GEA/4
0 encryption algorithm GEA/4 not available
1 encryption algorithm GEA/4 available

GEA/5
0 encryption algorithm GEA/5 not available
1 encryption algorithm GEA/5 available

GEA/6
0 encryption algorithm GEA/6 not available
1 encryption algorithm GEA/6 available

GEA/7
0 encryption algorithm GEA/7 not available
1 encryption algorithm GEA/7 available

10.5.5.12a MS Radio Access capability

The purpose of the *MS RA capability* information element is to provide the radio part of the network with information concerning radio aspects of the mobile station. The contents might affect the manner in which the network handles the operation of the mobile station.

The *MS RA capability* is a type 4 information element, with a maximum length of 52 octets.

The value part of a *MS RA capability* information element is coded a shown table 10.5.146/3GPP TS 24.008.

For the indication of the Access Technology Types the following conditions shall apply:

- Among the three Access Technology Types GSM 900-P, GSM 900-E and GSM 900-R only one shall be present.
- Due to shared radio frequency channel numbers between GSM 1800 and GSM 1900, the mobile station should provide the relevant radio access capability for either GSM 1800 band OR GSM 1900 band, not both.
- The MS shall indicate its supported Access Technology Types during a single MM procedure.
- If the alternative coding by using the Additional access technologies struct is chosen by the mobile station, the mobile station shall indicate its radio access capability for the serving BCCH frequency band in the first includedAccess capabilities struct.
- The first Access Technology Type shall not be set to "1111".

For error handling the following shall apply:

– If a received Access Technology Type is unknown to the receiver, it shall ignore all the corresponding fields;

– If within a known Access Technology Type a receiver recognizes an unknown field it shall ignore it.

– For more details about error handling of MS radio access capability see 3GPP TS 08.18.

NOTE: The MS should not add spare bits following the <Content> field for the Access capabilities of an Access Technology Type, i.e. the MS should encode the <Length> field of the < Access capabilities struct > as the length in bits of <Content> only.

Table 10.5.146/3GPP TS 24.008 : *Mobile Station Radio Access Capability* Information Element

< MS Radio Access capability IE > ::=
<**MS Radio Access capability IEI** : 00100100 >
<**Length of MS RA capability**: <octet>> -- *length in octets of MS RA capability value part and spare bits*
<**MS RA capability value part** : < MS RA capability value part struct >>
<spare bits>**; -- *may be used for future enhancements*

<MS RA capability value part struct >::= --*recursive structure allows any number of Access technologies*
{ { < **Access Technology Type**: bit (4) exclude 1111 >
< **Access capabilities** : <Access capabilities struct> > }

| { < **Access Technology Type**: bit (4) == 1111 > -- *structure adding Access technologies with same capabilities*
< **Length** : bit (7) > -- *length in bits of list of Additional access technologies and spare bits*
{ 1 < **Additional access technologies**: < Additional access technologies struct > > } ** 0
<spare bits>** } }

{ 0 | 1 <MS RA capability value part struct> } ;

< Additional access technologies struct > ::=
< **Access Technology Type** : bit (4) >
< **GMSK Power Class** : bit (3) >
< **8PSK Power Class** : bit (2) > ;

< Access capabilities struct > ::=
< **Length** : bit (7) > -- length in bits of Content and spare bits
<Access capabilities : <Content>>
<spare bits>** ; -- expands to the indicated length
-- may be used for future enhancements

< Content > ::=
< **RF Power Capability** : bit (3) >
{ 0 | 1 <**A5 bits** : <A5 bits> > } -- *zero means that the same values apply for parameters as in the immediately preceding Access capabilities field within this IE*
< **ES IND** : bit >
< **PS** : bit >
< **VGCS** : bit >
< **VBS** : bit >
{ 0 | 1 < **Multislot capability** : Multislot capability struct > } -- *zero means that the same values for multislot parameters as given in an earlier Access capabilities field within this IE apply also here*
-- Additions in release 99
{ 0 | 1 < **8PSK Power Capability** : bit(2) >} -- *'1' also means 8PSK modulation capability in uplink.*
< **COMPACT Interference Measurement Capability : bit >**
< **Revision Level Indicator** : bit >
< **UMTS FDD Radio Access Technology Capability** : bit > -- *3G RAT*
< **UMTS 3.84 Mcps TDD Radio Access Technology Capability** : bit > -- *3G RAT*
< **CDMA 2000 Radio Access Technology Capability** : bit >; -- *3G RAT*
error: struct too short, assume features do not exist
-- error: struct too long, ignore data and jump to next Access technology

Table 10.5.146/3GPP TS 24.008 (continued): *Mobile Station Radio Access Capability* IE

< Multislot capability struct > ::=
{ 0 | 1 < **HSCSD multislot class** : bit (5) > }
{ 0 | 1 < **GPRS multislot class** : bit (5) > < **GPRS Extended Dynamic Allocation Capability** : bit > }
{ 0 | 1 < **SMS_VALUE** : bit (4) > < **SM_VALUE** : bit (4) > }
-- Additions in release 99
{ 0 | 1 < **ECSD multislot class** : bit (5) > }
{ 0 | 1 < **EGPRS multislot class** : bit (5) > < **EGPRS Extended Dynamic Allocation Capability** : bit > }
{ 0 | 1 < **DTM GPRS Multi Slot Sub-Class**: bit(2)>

<MAC Mode Support : bit>
{0 | 1 <**DTM EGPRS Multi Slot Sub-Class** : bit(2)> } } ;
-- error: struct too short, assume features do not exist

<A5 bits> ::= < A5/1 : bit> <A5/2 : bit> <A5/3 : bit> <A5/4 : bit> <A5/5 : bit> <A5/6 : bit> <A5/7 : bit>; -- bits for circuit mode ciphering algorithms. These fields are not used by the network and may be excluded by the MS.

Access Technology Type
This field indicates the access technology type to be associated with the following access capabilities.
Bits
4 3 2 1
0 0 0 0 GSM P
0 0 0 1 GSM E *--note that GSM E covers GSM P*
0 0 1 0 GSM R *--note that GSM R covers GSM E and GSM P*
0 0 1 1 GSM 1800
0 1 0 0 GSM 1900
0 1 0 1 GSM 450
0 1 1 0 GSM 480
0 1 1 1 GSM 850
1 1 1 1 Indicates the presence of a list of Additional access technologies
All other values are treated as unknown by the receiver.

RF Power Capability, GMSK Power Class (3 bit field)
This field contains the binary coding of the power class used for GMSK associated with the indicated Access Technology Type (see 3GPP TS 05.05).

8PSK Power Capability (2 bit field)
If 8-PSK modulation is supported for uplink, this field indicates the radio capability for 8-PSK modulation. The following coding is used (see 3GPP TS 05.05):
Bits 2 1
0 0 Reserved
0 1 Power class E1
1 0 Power class E2
1 1 Power class E3

8PSK Power Class (2 bit field)
This field indicates the radio capability for 8-PSK modulation. The following coding is used (see 3GPP TS 05.05):
Bits 2 1
0 0 8PSK modulation not supported for uplink
0 1 Power class E1
1 0 Power class E2
1 1 Power class E3

Additional access technologies struct
This structure contains the GMSK Power Class and 8PSK Power Class for an additional Access Technology. All other capabilities for this indicated Access Technology are the same as the capabilities indicated by the preceding Access capabilities struct.

A5/1
0 encryption algorithm A5/1 not available
1 encryption algorithm A5/1 available
A5/2
0 encryption algorithm A5/2 not available
1 encryption algorithm A5/2 available
A5/3
0 encryption algorithm A5/3 not available
1 encryption algorithm A5/3 available
A5/4
0 encryption algorithm A5/4 not available
1 encryption algorithm A5/4 available
A5/5
0 encryption algorithm A5/5 not available
1 encryption algorithm A5/5 available
A5/6
0 encryption algorithm A5/6 not available
1 encryption algorithm A5/6 available
A5/7
0 encryption algorithm A5/7 not available

1 encryption algorithm A5/7 available

ES IND – (Controlled early Classmark Sending)
0 "controlled early Classmark Sending" option is not implemented
1 "controlled early Classmark Sending" option is implemented

Table 10.5.146/3GPP TS 24.008 (concluded): *Mobile Station Radio Access Capability* Information Element

PS – (Pseudo Synchronisation)
0 PS capability not present
1 PS capability present

VGCS – (Voice Group Call Service)
0 no VGCS capability or no notifications wanted
1 VGCS capability and notifications wanted.

VBS – (Voice Broadcast Service)
0 no VBS capability or no notifications wanted
1 VBS capability and notifications wanted

HSCSD Multi Slot Class
The Multi Slot Class field is coded as the binary representation of the multislot class defined in 3GPP TS ~~GSM~~ 05.02. This field is not used by the network and may be excluded by the MS.
Range 1 to 18, all other values are reserved.

GPRS Multi Slot Class
The GPRS Multi Slot Class field is coded as the binary representation of the multislot class defined in 3GPP TS ~~GSM~~ 05.02.

ECSD Multi Slot Class
The presence of this field indicates ECSD capability. Whether the MS is capable of 8-PSK modulation in uplink is indicated by the presence of 8-PSK Power Capability field. The Multi Slot Class field is coded as the binary representation of the multislot class defined in 3GPP TS ~~GSM~~ 05.02. This field is not used by the network and may be excluded by the MS.
Range 1 to 18, all other values are reserved.

EGPRS Multi Slot Class
The presence of this field indicates EGPRS capability. Whether the MS is capable of 8-PSK modulation in uplink is indicated by the presence of 8-PSK Power Capability field. The EGPRS Multi Slot Class field is coded as the binary representation of the multislot class defined in 3GPP TS ~~GSM~~ 05.02.

GPRS Extended Dynamic Allocation Capability
0 Extended Dynamic Allocation Capability for GPRS is not implemented
1 Extended Dynamic Allocation Capability for GPRS is implemented
EGPRS Extended Dynamic Allocation Capability
0 Extended Dynamic Allocation Capability for EGPRS is not implemented
1 Extended Dynamic Allocation Capability for EGPRS is implemented

SMS_VALUE (Switch-Measure-Switch) (4 bit field)
The SMS field indicates the time needed for the mobile station to switch from one radio channel to another, perform a neighbor cell power measurement, and the switch from that radio channel to another radio channel. This field is not used by the network and may be excluded by the MS.
Bits
4 3 2 1
0 0 0 0 1/4 timeslot (~144 microseconds)
0 0 0 1 2/4 timeslot (~288 microseconds)
0 0 1 0 3/4 timeslot (~433 microseconds)
. . .
1 1 1 1 16/4 timeslot (~2307 microseconds)
(SM_VALUE) Switch-Measure (4 bit field)
The SM field indicates the time needed for the mobile station to switch from one radio channel to another and perform a neighbour cell power measurement. This field is not used by the network and may be excluded by the MS.
Bits
4 3 2 1
0 0 0 0 1/4 timeslot (~144 microseconds)

0 0 0 1	2/4 timeslot (~288 microseconds)
0 0 1 0	3/4 timeslot (~433 microseconds)
. . .	
1 1 1 1	16/4 timeslot (~2307 microseconds)

DTM GPRS Multi Slot Sub-Class (2 bit field)
This field indicates the GPRS DTM capabilities of the MS. The GPRS DTM Multi Slot Sub-Class is independent from the Multi Slot Capabilities field.

Bits	
2 1	
0 0	Sub-Class 1 supported
0 1	Sub-Class 5 supported
1 0	Sub-Class 9 supported
1 1	Reserved for future extension. If received, the network shall interpret this as '00'

DTM EGPRS Multi Slot Sub-Class (2 bit field)
This field indicates the EGPRS DTM capabilities of the MS. The DTM EGPRS Multi Slot Sub-Class is independent from the Multi Slot Capabilities field. This field shall be included only if the mobile station supports EGPRS DTM. This field is coded as the DTM GPRS Multislot Sub-Class field.

MAC Mode Support (1 bit field)
This field indicates whether the MS supports Dynamic and Fixed Allocation or only supports Exclusive Allocation

Bit	
0	Dynamic and Fixed Allocation not supported
1	Dynamic and Fixed allocation supported

COMPACT Interference Measurement Capability (1 bit field)

Bit	
0	COMPACT Interference Measurement Capability is not implemented
1	COMPACT Interference Measurement Capability is implemented

Revision Level Indicator (1 bit field)

Bit	
0	The ME is Release '98 or older
1	The ME is Release '99 onwards

UMTS FDD Radio Access Technology Capability (1 bit field)

Bit	
0	UMTS FDD not supported
1	UMTS FDD supported

UMTS 3.84 Mcps TDD Radio Access Technology Capability (1 bit field)

Bit	
0	UMTS 3.84 Mcps TDD not supported
1	UMTS 3.84 Mcps TDD supported

CDMA 2000 Radio Access Technology Capability (1 bit field)

Bit	
0	CDMA2000 not supported
1	CDMA2000 supported

10.5.5.21 Cell Notification

The purpose of the Cell Notification information element is to indicate that the Cell Notification is supported by the network and shall be then used by MS.

The Cell Notification information element is coded as shown in figure 10.5.135a/~~GSM~~3GPP TS 24.008.

The Cell Notification is a type 2 information element.

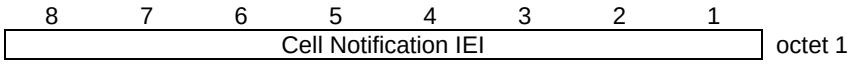

Figure 10.5.135a/~~GSM~~3GPP TS 24.008: Cell Notification information element

10.5.6.1 Access Point Name

The purpose of the *access point name* information element is to identify the packet data network to which the GPRS user wishes to connect and to notify the access point of the packet data network that wishes to connect to the MS.

The Access Point Name is a label or a full qualified domain name according to DNS naming conventions (see 3GPP TS 23.003 [10]).

The *access point name* is a type 4 information element with a minimum length of 3 octets and a maximum length of 102 octets.

The *access point name* information element is coded as shown in figure 10.5.134/3GPP TS 24.008 and table 10.5.152/3GPP TS 24.008.

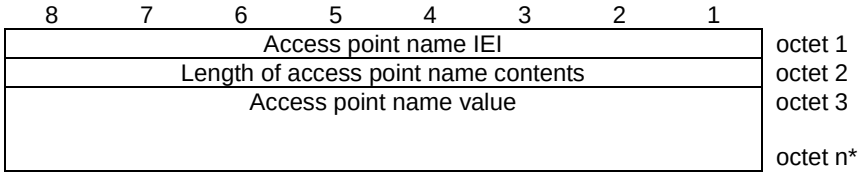

Figure 10.5.134/3GPP TS 24.008: *Access point name* information element

The value part is defined in 3GPP TS ~~03.03~~23.003 [10].

10.5.6.10 Tear down indicator

The purpose of the *tear down indicator* information element is to indicate whether only the PDP context associated with this specific TI or all active PDP contexts sharing the same PDP address as the PDP context associated with this specific TI shall be deactivated.

The *tear down indicator* is a type 1 information element.

The *tear down indicator* information element is coded as shown in figure 10.5.142/3GPP TS 24.008 and table 10.5.160/3GPP TS 24.008.

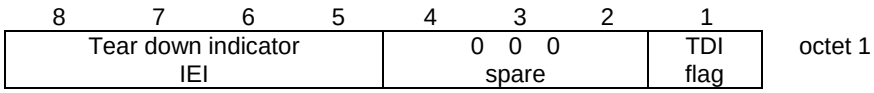

Figure 10.5.142/3GPP TS 24.008: *Tear down indicator* information element

Table 10.5.160/~~GSM~~3GPP TS ~~04.08~~24.008: *Tear down indicator* information element

Tear down indicator(TDI) flag (octet 1) Bit **1** 0 tear down not requested 1 tear down requested

11.2.1 Timer T3240 and Timer T3241

Timer T3240 is started in the mobile station when:

- the mobile station receives a LOCATION UPDATING ACCEPT message completing a location updating procedure in the cases specified in clause 4.4.4.6 and 4.4.4.8;
- the mobile station receives a LOCATION UPDATING REJECT message in the cases specified in clause 4.4.4.7;
- the mobile station has sent a CM SERVICE ABORT message as specified in clause 4.5.1.7;
- the mobile station has released or aborted all MM connections in the cases specified in 4.3.2.5, 4.3.5.2, 4.5.1.1, and 4.5.3.1.

Timer T3240 is stopped, reset, and started again at receipt of an MM message.

Timer T3240 is stopped and reset (but not started) at receipt of a CM message that initiates establishment of an CM connection (an appropriate SETUP, REGISTER, or CP-DATA message as defined in 3GPP TS 24.008, 3GPP TS 24.010 or ~~GSM~~3GPP TS ~~04.11~~24.011).

Timer T3241 is started in the mobile station when entering MM state RR CONNECTION RELEASE NOT ALLOWED.

Timer T3241 is stopped and reset (but not started) when the MM state RR CONNECTION RELEASE NOT ALLOWED is left.

If timer T3241 expires, the MS shall abort the RR connection and enter the MM state MM IDLE.

11.3 Timers of circuit-switched call control

Table 11.3/3GPP TS 24.008: Call control timers - MS side

TIM NUM.	TIM VAL	STATE OF CALL	CAUSE OF START	NORMAL STOP	AT FIRST EXPIRY	AT SECOND EXPIRY
T303	30s	Call initiated	CM SER RQ sent	CALL PROC, or REL COMP received	Clear the call	Timer is not restarted
T305	30s	Disconnect Request	DISC sent	REL or DISC received	REL sent.	Timer is not restarted
T308	30s	Release request	REL sent	REL COMP or REL received	Retrans. RELEASE restart T308	Call ref. release
T310 Note 1	30s	Outgoing call Proceeding	CALL PROC received	ALERT,CONN, DISC or PROG rec.	Send DISC	Timer is not restarted
T313	30s	Connect Request	CONN sent	CONNect ACKnowledge received	Send DISC	Timer is not restarted
T323	30s	Modify Request	MOD sent	MOD COMP or MOD REJ received	Clear the call	Timer is not restarted
T332	30s	Wait for network info	START_CC sent	CC-EST. received	Clear the call	Timer is not restarted
T335	30s	CC-Est. Confirmed	CC-EST CONF.sent	RECALL received	Clear the call	Timer is not restarted
T336	10s		START DTMF sent	START DTMF ACK or START DTMF REJECT received	The MS considers the DTMF Procedure (for the digit) to be terminated	Timer is not restarted
T337	10s		STOP DTMF sent	STOP DTMF ACK received	The MS considers the DTMF procedure (for the current digit) to be terminated	Timer is not restarted

NOTE 1: T310 is not started if progress indicator #1, #2, or #64 has been delivered in the CALL PROCEEDING message or in a previous PROGRESS message.

Table 11.4/3GPP TS 24.008: Call control timers - network side

TIM NUM.	DFT TIM VAL	STATE OF CALL	CAUSE FOR START	NORMAL STOP	AT FIRST EXPIRY	AT SECOND EXPIRY
T301 Note 1	Min180s	Call received	ALERT received	CONN received	Clear the call	Timer is not restarted
T303	Note 2	Call present	SETUP sent	CALL CONF or REL COMP received	Clear the call	Timer is not restarted
T305	30s	Disconnect Indication	DISC without progress indic. #8 sent or CCBS Possible	REL or DISC received	Network sends RELEASE	Timer is not restarted
T306	30s	Disconnect Indication	DISC with progress indic. #8 sent but no CCBS possible	REL or DISC received	Stop the tone/ announc. Send REL	Timer is not restarted
T308	Note 2	Release request	REL sent	REL COMP or REL received	Retrans. RELEASE restart T308	Release call reference
T310	Note 2	Incoming call proceeding	CALL CONF received	ALERT, CONN or DISC received	Clear the call	Timer is not restarted
T313	Note 2	Connect Indication	CON sent	CON ACK received	Clear the call	Timer is not restarted
T323	30s	Modify request	MOD sent	MOD COMP or MOD REJ received	Clear the call	Timer is not restarted
T331	Note 2	CC Connec. Pending	CM-SERV PROMPT sent	START CC received	Clear the call	Timer is not restarted
T333	Note 2	CC-Est. Present	START CC received	CC-EST.CONF or REL COMP received	Clear the call	Timer is not restarted
T334 Note 3	Min 15s	CC-Est. Confirmed	RECALL sent	SETUP received	Clear the call	Timer is not restarted
T338	Note 2	Disconnect indication	DISC with CCBS possible	REL or DISC received	stop any tone/ announc. Send REL	Timer is not restarted

NOTE 1: The network may already have applied an internal alerting supervision function; e.g. incorporated within call control. If such a function is known to be operating on the call, then timer T301 is not used.

NOTE 2: These time values are set by the network operator.

NOTE 3: When applied to the supplementary service CCBS, the timer T334 can either represent the recall timer T4 or the notification timer T10 (see ~~GSM~~3GPP TS ~~03.93~~23.093). Thus the timer T334 can take two different values. ~~GSM~~3GPP TS ~~03.93~~23.093 defines the range of these values.

11.3 Timers of circuit-switched call control

Table 11.3/3GPP TS 24.008: Call control timers - MS side

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T303	30s	Call initiated	CM SER RQ sent	CALL PROC, or REL COMP received	Clear the call	Timer is not restarted
T305	30s	Disconnect Request	DISC sent	REL or DISC received	REL sent.	Timer is not restarted
T308	30s	Release request	REL sent	REL COMP or REL received	Retrans. RELEASE restart T308	Call ref. release
T310 Note 1	30s	Outgoing call Proceeding	CALL PROC received	ALERT,CONN, DISC or PROG rec.	Send DISC	Timer is not restarted
T313	30s	Connect Request	CONN sent	CONNect ACKnowledge received	Send DISC	Timer is not restarted
T323	30s	Modify Request	MOD sent	MOD COMP or MOD REJ received	Clear the call	Timer is not restarted
T332	30s	Wait for network info	START_CC sent	CC-EST. received	Clear the call	Timer is not restarted
T335	30s	CC-Est. Confirmed	CC-EST CONF.sent	RECALL received	Clear the call	Timer is not restarted
T336	10s		START DTMF sent	START DTMF ACK or START DTMF REJECT received	The MS considers the DTMF Procedure (for the digit) to be terminated	Timer is not restarted
T337	10s		STOP DTMF sent	STOP DTMF ACK received	The MS considers the DTMF procedure (for the current digit) to be terminated	Timer is not restarted

NOTE 1: T310 is not started if progress indicator #1, #2, or #64 has been delivered in the CALL PROCEEDING message or in a previous PROGRESS message.

Table 11.4/3GPP TS 24.008: Call control timers - network side

TIM NUM.	DFT TIM VAL	STATE OF CALL	CAUSE FOR START	NORMAL STOP	AT FIRST EXPIRY	AT SECOND EXPIRY
T301 Note 1	Min180s	Call received	ALERT received	CONN received	Clear the call	Timer is not restarted
T303	Note 2	Call present	SETUP sent	CALL CONF or REL COMP received	Clear the call	Timer is not restarted
T305	30s	Disconnect Indication	DISC without progress indic. #8 sent or CCBS Possible	REL or DISC received	Network sends RELEASE	Timer is not restarted
T306	30s	Disconnect Indication	DISC with progress indic. #8 sent but no CCBS possible	REL or DISC received	Stop the tone/ announc. Send REL	Timer is not restarted
T308	Note 2	Release request	REL sent	REL COMP or REL received	Retrans. RELEASE restart T308	Release call reference
T310	Note 2	Incoming call proceeding	CALL CONF received	ALERT, CONN or DISC received	Clear the call	Timer is not restarted
T313	Note 2	Connect Indication	CON sent	CON ACK received	Clear the call	Timer is not restarted
T323	30s	Modify request	MOD sent	MOD COMP or MOD REJ received	Clear the call	Timer is not restarted
T331	Note 2	CC Connec. Pending	CM-SERV PROMPT sent	START CC received	Clear the call	Timer is not restarted
T333	Note 2	CC-Est. Present	START CC received	CC-EST.CONF or REL COMP received	Clear the call	Timer is not restarted
T334 Note 3	Min 15s	CC-Est. Confirmed	RECALL sent	SETUP received	Clear the call	Timer is not restarted
T338	Note 2	Disconnect indication	DISC with CCBS possible	REL or DISC received	stop any tone/ announc. Send REL	Timer is not restarted

NOTE 1: The network may already have applied an internal alerting supervision function; e.g. incorporated within call control. If such a function is known to be operating on the call, then timer T301 is not used.

NOTE 2: These time values are set by the network operator.

NOTE 3: When applied to the supplementary service CCBS, the timer T334 can either represent the recall timer T4 or the notification timer T10 (see ~~GSM~~3GPP TS ~~03.93~~23.093). Thus the timer T334 can take two different values. ~~GSM~~3GPP TS ~~03.93~~23.093 defines the range of these values.

11.3 Timers of circuit-switched call control

Table 11.3/3GPP TS 24.008: Call control timers - MS side

TIM NUM.	TIM VAL	STATE OF CALL	CAUSE OF START	NORMAL STOP	AT FIRST EXPIRY	AT SECOND EXPIRY
T303	30s	Call initiated	CM SER RQ sent	CALL PROC, or REL COMP received	Clear the call	Timer is not restarted
T305	30s	Disconnect Request	DISC sent	REL or DISC received	REL sent.	Timer is not restarted
T308	30s	Release request	REL sent	REL COMP or REL received	Retrans. RELEASE restart T308	Call ref. release
T310 Note 1	30s	Outgoing call Proceeding	CALL PROC received	ALERT,CONN, DISC or PROG rec.	Send DISC	Timer is not restarted
T313	30s	Connect Request	CONN sent	CONNect ACKnowledge received	Send DISC	Timer is not restarted
T323	30s	Modify Request	MOD sent	MOD COMP or MOD REJ received	Clear the call	Timer is not restarted
T332	30s	Wait for network info	START_CC sent	CC-EST. received	Clear the call	Timer is not restarted
T335	30s	CC-Est. Confirmed	CC-EST CONF.sent	RECALL received	Clear the call	Timer is not restarted
T336	10s		START DTMF sent	START DTMF ACK or START DTMF REJECT received	The MS considers the DTMF Procedure (for the digit) to be terminated	Timer is not restarted
T337	10s		STOP DTMF sent	STOP DTMF ACK received	The MS considers the DTMF procedure (for the current digit) to be terminated	Timer is not restarted

NOTE 1: T310 is not started if progress indicator #1, #2, or #64 has been delivered in the CALL PROCEEDING message or in a previous PROGRESS message.

Table 11.4/3GPP TS 24.008: Call control timers - network side

TIM NUM.	DFT TIM VAL	STATE OF CALL	CAUSE FOR START	NORMAL STOP	AT FIRST EXPIRY	AT SECOND EXPIRY
T301 Note 1	Min180s	Call received	ALERT received	CONN received	Clear the call	Timer is not restarted
T303	Note 2	Call present	SETUP sent	CALL CONF or REL COMP received	Clear the call	Timer is not restarted
T305	30s	Disconnect Indication	DISC without progress indic. #8 sent or CCBS Possible	REL or DISC received	Network sends RELEASE	Timer is not restarted
T306	30s	Disconnect Indication	DISC with progress indic. #8 sent but no CCBS possible	REL or DISC received	Stop the tone/ announc. Send REL	Timer is not restarted
T308	Note 2	Release request	REL sent	REL COMP or REL received	Retrans. RELEASE restart T308	Release call reference
T310	Note 2	Incoming call proceeding	CALL CONF received	ALERT, CONN or DISC received	Clear the call	Timer is not restarted
T313	Note 2	Connect Indication	CON sent	CON ACK received	Clear the call	Timer is not restarted
T323	30s	Modify request	MOD sent	MOD COMP or MOD REJ received	Clear the call	Timer is not restarted
T331	Note 2	CC Connec. Pending	CM-SERV PROMPT sent	START CC received	Clear the call	Timer is not restarted
T333	Note 2	CC-Est. Present	START CC received	CC-EST.CONF or REL COMP received	Clear the call	Timer is not restarted
T334 Note 3	Min 15s	CC-Est. Confirmed	RECALL sent	SETUP received	Clear the call	Timer is not restarted
T338	Note 2	Disconnect indication	DISC with CCBS possible	REL or DISC received	stop any tone/ announc. Send REL	Timer is not restarted

NOTE 1: The network may already have applied an internal alerting supervision function; e.g. incorporated within call control. If such a function is known to be operating on the call, then timer T301 is not used.

NOTE 2: These time values are set by the network operator.

NOTE 3: When applied to the supplementary service CCBS, the timer T334 can either represent the recall timer T4 or the notification timer T10 (see ~~GSM~~3GPP TS ~~03.93~~23.093). Thus the timer T334 can take two different values. ~~GSM~~3GPP TS ~~03.93~~23.093 defines the range of these values.

B.2.2 Compatibility/Subscription checking of the SETUP message

At the calling side the network shall check that the basic service(s) requested by the calling MS in the Bearer Capability information element(s) match(es) with the basic services provided to that subscriber by the PLMN. If for at least one bearer capability information element contained in the SETUP message a mismatch is detected, then the network shall proceed as follows:

- if the SETUP message contained two bearer capability information elements for only one of which a mismatch is detected, the network shall either:

  - under the conditions specified in 3GPP TS 27.001 (e.g. 3GPP TS 61 and 3GPP TS 62), accept the SETUP message with a CALL PROCEEDING message containing the, possibly negotiated, bearer capability information element for which no mismatch is detected, or

  - reject the call using one of the causes listed in annex H.

- otherwise the network shall reject the call using one of the causes listed in annex H.

Network services are described in 3GPP TS 22.002 and ~~GSM~~3GPP TS ~~02.03~~22.003 as bearer services and teleservices, respectively.

C.2.1 Definition of types of information

There are three different types of information that the calling PLMN user may specify during call setup to identify low layer capabilities needed in the network and in the destination terminal:

a) type I information is information about the calling terminal which is only used at the destination end to allow a decision regarding terminal compatibility. An example would be the user information layer 3 protocol. Type I information is encoded in octets 5 to 7 of the low layer compatibility information element;

b) type II information is only used by the network (PLMN) to which the calling user is connected for selection of PLMN specific network resources, e.g. channel type or specific functionality within the interworking function (IWF, see 3GPP TS ~~09.07~~29.007). This type of information is always present. An example is the connection element. Type II information is coded in:

   i) octet 3 of the bearer capability information element when the information transfer capability required by the calling user is speech ;

   ii) octets 3, 4, 5, and optionally octet 7 of the bearer capability information element when the information transfer capability required by the calling user is not speech;

c) type III information is required for selection of a basic service from the choice of basic services offered by the network and together with type II information for selection of an appropriate interworking function (IWF, see 3GPP TS 29.007), as well as for terminal compatibility checking at the destination terminal . An example is the information transfer capability. Type III information is always present and is encoded in:

   i) octet 3 of the bearer capability information element when the information transfer capability required by the calling user is speech ;

   ii) octets 3, 5, 6, 6a, 6b and 6c of the bearer capability information element when the information transfer capability required by the calling user is not speech;

Annex E (informative): Comparison between call control procedures specified in 3GPP TS 24.008 and ITU-T Recommendation Q.931

This annex is informative.

This annex summarizes a comparison of the procedures for call control as specified in ITU-T Recommendation Q.931 (blue book) and 3GPP TS 24.008.

If no comment is given, it means that the procedures specified in ITU-T Recommendation Q.931 and 3GPP TS 24.008 are similar. However, it should be noted that even in such cases the procedures may be described in slightly different ways in the two documents.

Table E.1 3GPP TS 24.008: Circuit-switched call control procedures

Procedure	Q.931	~~GSM~~3GPP TS 24.008
Call establishment at the originating interface	5.1	5.2.1
- call request	5.1.1	5.2.1.1.1 en-bloc sending only
- B-channel selection originating	5.1.2	not applicable
- overlap sending	5.1.3	not supported
- invalid call information	5.1.4	5.2.1.1.2
- call proceeding, en-bloc sending	5.1.5.1	5.2.1.1.3
- call proceeding, overlap sending	5.1.5.2	not supported
- notification of interworking at the originating interf.	5.1.6	5.2.1.1.4
- call confirmation indication	5.1.7	5.2.1.1.5
- call connected	5.1.8	5.2.1.1.6
- call rejection	5.1.9	5.2.1.1.7
- transit network selection	5.1.10	5.2.1.1.8

Table E.1 3GPP TS 24.008: Circuit-switched call control procedures (continued)

Procedure	Q.931	~~GSM~~3GPP TS 24.008
Call establishment at the destination interface	5.2	5.2.2
- call indication	5.2.1	5.2.2.1 procedure for multiple terminal configuration not required, i.e. delivery of SETUP messages on broadcast data links is not supported
- compatibility checking	5.2.2	5.2.2.2 equivalent, except that delivery of SETUP messages on broadcast data links is not supported
- B-channel selection destination	5.2.3	not applicable
- overlap receiving	5.2.4	not supported
- call confirmation information	5.2.5	5.2.2.3 equivalent, except that delivery of SETUP messages on broadcast data links is not supported
- notification of interworking at the terminating interf.	5.2.6	5.2.2.4
- call accept indication	5.2.7	5.2.2.5
- active indication	5.2.8	5.2.2.6 equivalent, except that SETUP messages are not sent on broadcast data links
- non-selected user clearing	5.2.9	not applicable

Table E.1 3GPP TS 24.008: Circuit-switched call control procedures (continued)

Procedure	Q.931	~~GSM~~3GPP TS 24.008
Call clearing	5.3	5.4
- terminology	5.3.1	5.4.1 terminology adapted to GSM applications
- exception conditions	5.3.2	5.4.2 only case a) of clause 5.3.2 of Rec. Q.931 applies. All other exceptions apply to functions which are not relevant to GSM
- clearing initiated by the user/MS	5.3.3	5.4.3
- clearing initiated by the network	5.3.4	5.4.4
- clearing when tones/announcements are provided	5.3.4.1	5.4.4.1.1 and 5.4.4.2.1 exception: if not already connected, the traffic channel is connected in order to provide the tone/announcement
- clearing when tones/announcements are not provided	5.3.4.2	5.4.4.1.2 and 5.4.4.2.3
- completion of clearing	5.3.4.3	5.4.4.1.3 and 5.4.4.2.5
Clear collision	5.3.5	5.4.5

Table E.1/3GPP TS 24.008: Circuit-switched call control procedures (continued)

Procedure	Q.931	~~GSM~~3GPP TS 24.008
In-band tones and announcements	5.4	5.5.1
Restart procedure	5.5	not supported
Call rearrangements	5.6	5.3.4 call suspension/call re-establishment not supported on the radio path. The functions, if required, are to be supported locally in the MS. On the radio interface, the notification procedure of Rec. Q.931 (clause5.6.7) applies
Call collisions	5.7	5.5.2 call collisions cannot occur
Emergency call establishment at the originating interface	not specified not supported	5.2.1.2
In-call modification	Annex O Rec. Q.931 is incomplete with regard to in-call modification procedures	5.3.4
DTMF protocol control procedures	not specified not supported	5.3.3
Call re-establishment	not specified not supported	5.5.4
Status enquiry procedure	5.8.10, 5.8.11	5.5.3
User-to-user signalling	7	~~GSM~~3GPP TS ~~04.10~~24.010
User notification procedure	5.9	5.3.1

I.1 Causes related to nature of request

Cause value = 25 LLC or SNDCP failure (GSM only)

This cause code is used by the MS indicate that a PDP context is deactivated because of a LLC or SNDCP failure (e.g. if the SM receives a *SNSM-STATUS.request* message with cause "*DM received* " or " *invalid XID response* ", see ~~GSM~~3GPP TS 04.65 [78])

Cause value = 26 Insufficient resources

This cause code is used by the MS or by the network to indicate that a PDP context activation request, secondary PDP context activation request or PDP context modification request cannot be accepted due to insufficient resources.

Cause value = 27 Unknown or missing access point name

This cause code is used by the network to indicate that the requested service was rejected by the external packet data network because the access point name was not included although required or if the access point name could not be resolved.

Cause value = 28 Unknown PDP address or PDP type

This cause code is used by the network to indicate that the requested service was rejected by the external packet data network because the PDP address or type could not be recognised.

Cause value = 29 User authentication failed

This cause code is used by the network to indicate that the requested service was rejected by the external packet data network due to a failed user authentication.

Cause value = 30 Activation rejected by GGSN

This cause code is used by the network to indicate that the requested service was rejected by the GGSN.

Cause value = 31 Activation rejected, unspecified

This cause code is used by the network to indicate that the requested service was rejected due to unspecified reasons.

Cause value = 32 Service option not supported

This cause code is used by the network when the MS requests a service which is not supported by the PLMN.

Cause value = 33 Requested service option not subscribed

See Annex G, clause 4.

Cause value = 34 Service option temporarily out of order

See Annex G, clause 4.

Cause value = 35 NSAPI already used

This cause code may be used by a network to indicate that the NSAPI requested by the MS in the PDP context activation request is already used by another active PDP context of this MS.

Never to be sent, but can be received from a R97/R98 network at PDP context activation

Cause value = 36 Regular PDP context deactivation

This cause code is used to indicate a regular MS or network initiated PDP context deactivation.

Cause value = 37 QoS not accepted

This cause code is used by the MS if the new QoS cannot be accepted that were indicated by the network in the PDP Context Modification procedure.

Cause value = 38 Network failure

This cause code is used by the network to indicate that the PDP context deactivation is caused by an error situation in the network.

Cause value = 39 Reactivation requested

This cause code is used by the network to request a PDP context reactivation after a GGSN restart.

Cause value = 40 Feature not supported

This cause code is used by the MS to indicate that the PDP context activation initiated by the network is not supported by the MS.

Cause value = 41 semantic error in the TFT operation.

This cause code is used by the network to indicate that the there is a semantic error in the TFT operation included in a secondary PDP context activation request or an MS-initiated PDP context modification.

Cause value = 42 syntactical error in the TFT operation.

This cause code is used by the network to indicate that there is a syntactical error in the TFT operation included in a secondary PDP context activation request or an MS-initiated PDP context modification.

Cause value = 43 unknown PDP context

This cause code is used by the network to indicate that the PDP context identified by the Linked TI IE the secondary PDP context activation request is not active.

Cause value = 44 semantic errors in packet filter(s)

This cause code is used by the network to indicate that there is one or more semantic errors in packet filter(s) of the TFT included in a secondary PDP context activation request or an MS-initiated PDP context modification.

Cause value = 45 syntactical error in packet filter(s)

This cause code is used by the network to indicate that there is one or more syntactical errors in packet filter(s) of the TFT included in a secondary PDP context activation request or an MS-initiated PDP context modification.

Cause value = 46 PDP context without TFT already activated

This cause code is used by the network to indicate that the network has already activated a PDP context without TFT.

3GPP TSG-CN1 Meeting #27 ***Tdoc N1-022418***
Bangkok, Thailand, 11 – 15 November 2002 **Rev. of N1-022322**

CR-Form-v7

CHANGE REQUEST

⌘ **24.008** **CR** **720** ⌘ **rev** **1** ⌘ Current version: **4.8.0** ⌘

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

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

Title:	⌘	Correcting errors and making improvements to references
Source:	⌘	CN1 secretary
Work item code:	⌘	TEI4
Date:	⌘	13/11/2002
Category:	⌘	**F**
Release:	⌘	Rel-4

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

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
Rel-4 (Release 4)
Rel-5 (Release 5)
Rel-6 (Release 6)

Reason for change:	⌘	Misleading references and missing or non-existing references are corrected.
Summary of change:	⌘	02.07 was split into 22.001 and 22.101. It was not referenced and this version only needs to refer 22.101. 02.40 was not continued after R98 but moved to 22.001. 24.071 and 24.108 is referenced but never existed, => 44.071 and 24.008. 04.64 has [76] as reference which is wrong, but 44.064 is introduced with [78a]. 03.01, 03.38, 03.93 becomes respectively 23.101, 23.038 and 23.093. The following were introduced in chapter 2 since they are refered to in the specification: 22.101, 23.038, 23.093, 23.108, 25.321, 25.322, 25.304, 25.413, 33.102 and 44.064. Some editorials do the final cleanup. Revised due to deleting ref.[9] (3GPP TS 03.01) in 5.2.1.10 since the feature is not carried on to 23.101. In 4.5.1.5 the last line that was deleted text is now merged to the NOTE, and in 10.5.4.5 the Note 4 and Note 5 is merged making Note 6 become Note 5.
Consequences if not approved:	⌘	Wrong guidance given and so confusing the readers.

Clauses affected:	⌘	1.1, 2, 4.4.4.7, 4.5.1.5, 4.5.1.6.1, 4.7.1.7, 4.7.3.1.4, 4.7.3.2.4, 4.7.4.2.2, 4.7.5.1.4, 4.7.5.2.3, 4.7.5.2.4, 4.7.6.3, 4.7.7.2, 4.7.7.3, 4.7.7.8, 4.7.13.4, 5.2.1.10, 5.2.2.3.3, 6.1.2, 7, 8.1, 8.8, 9.3.23, 10.1, 10.5.1.6, 10.5.1.7, 10.5.3.5a, 10.5.4.15, 10.5.4.24, 10.5.4.26, 10.5.5.12, 10.5.5.12a, 11.3, Annex C.2.1

		Y	N			
Other specs affected:	⌘		X	Other core specifications	⌘	
			X	Test specifications		

	X	O&M Specifications

Other comments: ⌘

How to create CRs using this form:

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

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

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

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

1.1 Scope of the Technical Specification

The procedures currently described in this TS are for the call control of circuit-switched connections, session management for GPRS services, mobility management and radio resource management for circuit-switched and GPRS services.

3GPP TS 24.010 contains functional procedures for support of supplementary services.

3GPP TS 24.011 contains functional procedures for support of point-to-point short message services.

3GPP TS 24.012 contains functional description of short message - cell broadcast.

3GPP TS 44.060 [76] contains procedures for radio link control and medium access control (RLC/MAC) of packet data physical channels.

3GPP TS ~~24.071~~44.071 [23a] contains functional descriptions and procedures for support of location services.

NOTE: "layer 3" includes the functions and protocols described in the present document. The terms "data link layer" and "layer 2" are used interchangeably to refer to the layer immediately below layer 3.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] Void.

[2] Void.

[2a] 3GPP TR 21.905 "Vocabulary for 3GPP Specifications"

[3] 3GPP TS 22.002: "Circuit Bearer Services (BS) supported by a Public Land Mobile Network (PLMN)".

[4] 3GPP TS 22.003: "Teleservices supported by a Public Land Mobile Network (PLMN)".

[5] 3GPP TS 42.009: " ~~Digital cellular telecommunications system (Phase 2+);~~ Security aspects".

[5a] 3GPP TS 33.102: "3G security; Security architecture".

[6] 3GPP TS 22.011: "~~ Digital cellular telecommunications system (Phase 2+);~~ Service accessibility".

[7] 3GPP TS 42.017: " ~~Digital cellular telecommunications system (Phase 2+);~~ Subscriber Identity Modules (SIM); Functional characteristics".

[8] 3GPP TS 22.101: "Service aspects; Service principles".~~3GPP TS 02.40: "Digital cellular telecommunications system (Phase 2+); Procedures for call progress indications".~~

[8a] 3GPP TS 22.001: "Principles of circuit telecommunication services supported by a Public Land Mobile Network (PLMN)".

[8b] 3GPP TS 23.038: "Alphabets and language-specific information".

[9] 3GPP TS 23.101: "General UMTS Architecture".~~3GPP TS 03.01: "Digital cellular telecommunications system (Phase 2+); Network functions".~~

[9a] 3GPP TS 23.108: "Mobile radio interface layer 3 specification core network protocols; Stage 2 (structured procedures)".

[10] 3GPP TS 23.003: "~~Digital cellular telecommunications system (Phase 2+);~~ Numbering, addressing and identification".

[11] 3GPP TS 43.013: "~~Digital cellular telecommunications system (Phase 2+);~~ Discontinuous Reception (DRX) in the GSM system".

[12] 3GPP TS 23.014: "~~Digital cellular telecommunications system (Phase 2+);~~ Support of Dual Tone Multi-Frequency (DTMF) signalling".

[12a] Void.

[13] 3GPP TS 43.020: "~~Digital cellular telecommunications system (Phase 2+);~~ Security-related network functions".

[14] 3GPP TS 23.122: "Non-Access-Stratum functions related to Mobile Station (MS) in idle mode".

[15] 3GPP TS 24.002: "GSM-UMTS Public Land Mobile Network (PLMN) access reference configuration".

[16] 3GPP TS 44.003: "~~Digital cellular telecommunications system (Phase 2+);~~ Mobile Station - Base Station System (MS - BSS) interface; Channel structures and access capabilities".

[17] 3GPP TS 44.004: "~~Digital cellular telecommunications system (Phase 2+);~~ Layer 1; General requirements".

[18] 3GPP TS 44.005: "~~Digital cellular telecommunications system (Phase 2+);~~ Data Link (DL) layer; General aspects".

[19] 3GPP TS 44.006: "~~Digital cellular telecommunications system (Phase 2+);~~ Mobile Station - Base Station System (MS - BSS) interface; Data Link (DL) layer specification".

[19a] 3GPP TS 25.321: "Medium Access Control (MAC) protocol specification".

[19b] 3GPP TS 25.322: "Radio Link Control (RLC) protocol specification".

[19c] 3GPP TS 25.413: "UTRAN Iu interface RANAP signalling".

[20] 3GPP TS 24.007: "~~Digital cellular telecommunications system (Phase 2+);~~ Mobile radio interface signalling layer 3; General aspects".

[21] 3GPP TS 24.010: "~~Digital cellular telecommunications system ;~~ Mobile radio interface layer 3; Supplementary services specification; General aspects".

[22] 3GPP TS 24.011: "Point-to-Point (PP) Short Message Service (SMS) support on mobile radio interface".

[23] 3GPP TS 24.012: "Short Message Service Cell Broadcast (SMSCB) support on the mobile radio interface".

[23a] 3GPP TS ~~24.071~~44.071: "Location Services (LCS); Mobile radio interface layer 3 specification~~Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 location services specification~~."

[23b] 3GPP TS 44.031 "~~Digital cellular telecommunication system (Phase 2+);~~ Location Services LCS); Mobile Station (MS) - Serving Mobile Location Centre (SMLC); Radio Resource LCS Protocol (RRLP)".

[23c] 3GPP TS 25.331: "~~3rd Generation Partnership Project;Technical Specification Group Radio Access Network;~~ Radio Resource Control (RRC) protocol specification"

[24] 3GPP TS 24.080: "~~Digital cellular telecommunications system (Phase 2+);~~ Mobile radio Layer 3 supplementary service specification; Formats and coding".

[25] 3GPP TS 24.081: "~~Digital cellular telecommunications system (Phase 2+);~~ Line identification supplementary services; Stage 3".

[26] 3GPP TS 24.082: "~~Digital cellular telecommunications system (Phase 2+);~~ Call Forwarding (CF) supplementary services; Stage 3".

[27] 3GPP TS 24.083: "~~Digital cellular telecommunications system (Phase 2+);~~ Call Waiting (CW) and Call Hold (HOLD) supplementary services; Stage 3".

[28] 3GPP TS 24.084: "~~Digital cellular telecommunications system (Phase 2+);~~ MultiParty (MPTY) supplementary services; Stage 3".

[29] 3GPP TS 24.085: "~~Digital cellular telecommunications system (Phase 2+);~~ Closed User Group (CUG) supplementary services; Stage 3".

[30] 3GPP TS 24.086: "~~Digital cellular telecommunications system (Phase 2+);~~ Advice of Charge (AoC) supplementary services; Stage 3".

[31] 3GPP TS 24.088: "Call Barring (CB) supplementary services; Stage 3".

[32] 3GPP TS 45.002: "~~Digital cellular telecommunications system (Phase 2+);~~ Multiplexing and multiple access on the radio path".

[33] 3GPP TS 45.005: "~~Digital cellular telecommunications system (Phase 2+);~~ Radio transmission and reception".

[34] 3GPP TS 45.008: "~~Digital cellular telecommunications system (Phase 2+);~~ Radio subsystem link control".

[35] 3GPP TS 45.010: "~~Digital cellular telecommunications system (Phase 2+);~~ Radio subsystem synchronization".

[36] 3GPP TS 27.001: "General on Terminal Adaptation Functions (TAF) for Mobile Stations (MS)".

[37] 3GPP TS 29.002: "~~Digital cellular telecommunications system (Phase 2+);~~ Mobile Application Part (MAP) specification".

[38] 3GPP TS 29.007: "~~Digital cellular telecommunications system (Phase 2+);~~ General requirements on interworking between the Public Land Mobile Network (PLMN) and the Integrated Services Digital Network (ISDN) or Public Switched Telephone Network (PSTN)".

[39] 3GPP TS 51.010: "~~Digital cellular telecommunications system (Phase 2+);~~ Mobile Station (MS) conformance specification".

[40] 3GPP TS 51.021: "~~Digital cellular telecommunications system (Phase 2);~~ GSM radio aspects base station system equipment specification".

[41] ISO/IEC 646 (1991): "Information technology - ISO 7-bit coded character set for information interchange".

[42] ISO/IEC 6429: "Information technology - Control functions for coded character sets".

[43] ISO 8348 (1987): "Information technology -- Open Systems Interconnection -- Network Service Definition".

[44] ITU-T Recommendation E.163: "Numbering plan for the international telephone service".

[45] ITU-T Recommendation E.164: "The international public telecommunication numbering plan".

[46] ITU-T Recommendation E.212: "The international identification plan for mobile terminals and mobile users".

[47] ITU-T Recommendation F.69 (1993): "The international telex service - Service and operational provisions of telex destination codes and telex network identification codes".

[48] ITU-T Recommendation I.330: "ISDN numbering and addressing principles".

[49] ITU-T Recommendation I.440 (1989): "ISDN user-network interface data link layer - General aspects".

[50] ITU-T Recommendation I.450 (1989): "ISDN user-network interface layer 3 General aspects".

[51] ITU-T Recommendation I.500 (1993): "General structure of the ISDN interworking recommendations".

[52] ITU-T Recommendation T.50: "International Reference Alphabet (IRA) (Formerly International Alphabet No. 5 or IA5) - Information technology - 7-bit coded character set for information interchange~~International Alphabet No. 5~~".

[53] ITU Recommendation Q.931: ISDN user-network interface layer 3 specification for basic control".

[54] ITU-T Recommendation V.21: "300 bits per second duplex modem standardized for use in the general switched telephone network".

[55] ITU-T Recommendation V.22: "1200 bits per second duplex modem standardized for use in the general switched telephone network and on point-to-point 2-wire leased telephone-type circuits".

[56] ITU-T Recommendation V.22bis: "2400 bits per second duplex modem using the frequency division technique standardized for use on the general switched telephone network and on point-to-point 2-wire leased telephone-type circuits".

[57] Void.

[58] ITU-T Recommendation V.26ter: "2400 bits per second duplex modem using the echo cancellation technique standardized for use on the general switched telephone network and on point-to-point 2-wire leased telephone-type circuits".

[59] ITU-T Recommendation V.32: "A family of 2-wire, duplex modems operating at data signalling rates of up to 9600 bit/s for use on the general switched telephone network and on leased telephone-type circuits".

[60] ITU-T Recommendation V.110: "Support by an ISDN of data terminal equipments with V-Series type interfaces".

[61] ITU-T Recommendation V.120: "Support by an ISDN of data terminal equipment with V-Series type interfaces with provision for statistical multiplexing".

[62] ITU-T Recommendation X.21: "Interface between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) for synchronous operation on public data networks".

[63] Void.

[64] Void.

[65] ITU-T Recommendation X.30: "Support of X.21, X.21 bis and X.20 bis based Data Terminal Equipments (DTEs) by an Integrated Services Digital Network (ISDN)".

[66] ITU-T Recommendation X.31: "Support of packet mode terminal equipment by an ISDN".

[67] Void.

[68] Void.

[69] ITU-T Recommendation X.121: "International numbering plan for public data networks".

[70] ETSI ETS 300 102-1: "Integrated Services Digital Network (ISDN); User-network interface layer 3; Specifications for basic call control".

[71] ETSI ETS 300 102-2: "Integrated Services Digital Network (ISDN); User-network interface layer 3; Specifications for basic call control; Specification Description Language (SDL) diagrams".

[72] ISO/IEC 10646: "Information technology -- Universal Multiple-Octet Coded Character Set (UCS)".

[73] 3GPP TS 22.060: "General Packet Radio Service (GPRS); Service Description; Stage 1".

[74] 3GPP TS 23.060: "General Packet Radio Service (GPRS); Service Description; Stage 2".

[75] 3GPP TS 43.064: "~~Digital cellular telecommunications system (Phase 2+);~~ General Packet Radio Service (GPRS); Overall description of the GPRS radio interface; Stage 2".

[76] 3GPP TS 44.060: "~~Digital cellular telecommunications system (Phase 2+);~~ General Packet Radio Service (GPRS); Mobile Station (MS) - Base Station System (BSS) interface; Radio Link Control/Medium Access Control (RLC/MAC) protocol".

[77] IETF RFC 1034: "Domain names - concepts and facilities".

[78] 3GPP TS 44.065: "~~Digital cellular telecommunications system (Phase 2+);~~ Mobile Station (MS) - Serving GPRS Support Node (SGSN); Subnetwork Dependent Convergence Protocol (SNDCP)".

[78a] 3GPP TS 44.064: "Mobile Station - Serving GPRS Support Node (MS-SGSN) Logical Link Control (LLC) Layer Specification".

[79] ITU Recommendation I.460: "Multiplexing, rate adaption and support of existing interfaces".

[80] 3GPP TS 26.111: "Codec for Circuit Switched Multimedia Telephony Service; Modifications to H.324".

[81] 3GPP TS 23.107: "Quality of Service (QoS) concept and architecture".

[82] 3GPP TS 43.022: "~~Digital cellular telecommunications system (Phase 2+);~~ Functions related to Mobile Station (MS) in idle mode and group receive mode".

[82a] 3GPP TS 25.304: "UE Procedures in Idle Mode and Procedures for Cell Reselection in Connected Mode".

[83] 3GPP TS 26.103: "Speech Codec List for GSM and UMTS".

[84] 3GPP TS 44.018: "Mobile radio interface layer 3 specification, Radio Resource Control Protocol".

[85] 3GPP TS 48.008: "Mobile-services Switching Centre – Base Station System (MSC – BSS) interface; layer 3 specification".

[86] 3GPP TS 48.018: "General Packet Radio Service (GPRS); Base Station System (BSS) - Serving GPRS Support Node (SGSN); BSS GPRS Protocol (BSSGP)".

[87] 3GPP TS 43.055: "Dual Transfer Mode (DTM); Stage 2".

[88] 3GPP TS 23.067: "enhanced Multi-Level Precedence and Pre-emption service (eMLPP); Stage 2".

[88a] 3GPP TS 23.093: "Technical realization of Completion of Calls to Busy Subscriber (CCBS); Stage 2".

[89] 3GPP TS 22.042: "Network Identity and Time Zone (NITZ), Stage 1".

[90] 3GPP TS 23.040: "Technical realization of Short Message Service (SMS)".

[91] 3GPP TS 44.056: "GSM Cordless Telephony System (CTS), (Phase 1) CTS Radio Interface Layer 3 Specification".

[92] 3GPP TS 23.205: "~~3rd Generation Partnership Project; Technical Specification Group Core Network;~~ Bearer-independent circuit-switched core network; Stage 2".

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, start T3240, enter state LOCATION UPDATING REJECTED await the release of the RR connection triggered by the network, and for all causes except #12, #14 and #15 deletes the list of "equivalent PLMNs".

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 subclause 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);

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 subclause 4.1.2.2). The mobile station shall store the PLMN identity in the "forbidden PLMN list".

The MS shall perform a PLMN selection when back to the MM IDLE state according to 3GPP TS 23.122 [14].

12: (Location Area not allowed);

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 subclause 4.1.2.2).

The mobile station shall store the LAI in the list of "forbidden location areas for regional provision of service".

The MS shall perform a cell selection when back to the MM IDLE state according to 3GPP TS ~~03.22~~43.022 and 3GPP TS 25.304.

13: (Roaming not allowed in this location area).

The mobile station shall reset the attempt counter, set the update status to ROAMING NOT ALLOWED (and store it in the SIM according to clause 4.1.2.2).

The mobile station shall store the LAI in the list of "forbidden location areas for roaming".

The mobile station shall perform a PLMN selection instead of a cell selection when back to the MM IDLE state according to 3GPP TS 23.122 [14].

15: (No Suitable Cells In Location Area).

The mobile station shall reset the attempt counter, set the update status to ROAMING NOT ALLOWED (and store it in the SIM according to clause 4.1.2.2).

The mobile station shall store the LAI in the list of "forbidden location areas for roaming".

The mobile station shall search for a suitable cell in another location area in the same PLMN according to 3GPP TS ~~03.22~~43.022 and 3GPP TS 25.304.

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

4.5.1.5 MM connection establishment for emergency calls

A MM connection for an emergency call may be established in all states of the mobility management sublayer which allow MM connection establishment for a normal originating call. In addition, establishment may be attempted in all service states where a cell is selected (see subclause 4.2.2) but not in the MM CONNECTION ACTIVE state (GROUP TRANSMIT MODE) state. However, as a network dependent option, a MM connection establishment for emergency call may be rejected in some of the states.

When a user requests an emergency call establishment the mobile station will send a CM SERVICE REQUEST message to the network with a CM service type information element indicating emergency call establishment. If the network does not accept the emergency call request, e.g., because IMEI was used as identification and this capability is not supported by the network, the network will reject the request by returning a CM SERVICE REJECT message to the mobile station.

The reject cause information element indicates the reason for rejection. The following cause values may apply:

#3 "Illegal MS"

#4 "IMSI unknown in VLR"

#5 "IMEI not accepted"

#6 "Illegal ME"

#17 "Network failure"

#22 "Congestion"

#32 "Service option not supported"

#34 "Service option temporarily out of order"

With the above defined exceptions, the procedures described for MM connection establishment in subclauses 4.5.1.1 and 4.5.1.2 shall be followed.

NOTE: Normally, the mobile station will be identified by an IMSI or a TMSI. However, if none of these identifiers is available in the mobile station, then the mobile station shall use the IMEI for identification purposes. The network may in that case reject the request by returning a CM SERVICE REJECT message with reject cause:

#5 "IMEI not accepted".

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 subclause 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 subclause 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 (3GPP TS 24.011), Call Independent Supplementary Services (3GPP TS 24.010 [21]) and Location Services (3GPP TS ~~24.071~~44.071 [23a]) 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 subclause 4.3.3) may be invoked.

The network may invoke the authentication procedure (see subclause 4.3.2).

In GSM, the network decides if the security mode setting procedure shall be invoked (see 3GPP TS 44.018 [84] subclause 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 3GPP TS 25.331 [23c]). 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 subclause 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 subclause 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 subclause 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.

4.7.1.7 Intersystem change between GSM and UMTS

For the UMTS to GSM and GSM to UMTS intersystem change the following cases can be distinguished:

a) Intersystem change between cells belonging to different RA's:

The procedures executed by the MS depends on the network mode of operation in the old and new RA. If a change of the network operation mode has occurred in the new RA, then the MS shall behave as specified in subclause 4.7.1.6. If no change of the network operation mode has occurred in the new RA, then the MS shall initiate the normal or combined RA update procedure depending on the network operation mode in the current RA.

b) Intersystem change between cells belonging to the same RA:

If the READY timer is running in the MS in GSM or the MS is in PMM-CONNECTED mode in UMTS, then the MS shall perform a normal or combined RA update procedure depending on the network mode of operation in the current RA.

If the READY timer is not running in the MS in GSM or the MS is in PMM-IDLE mode in UMTS, then the MS shall not perform a RA update procedure (as long as the MS stays within the same RA) until up-link user data or signalling information needs to be sent from the MS to the network.

- If the MS is in the same access network, GSM or UMTS, as when it last sent user data or signalling messages, the procedures defined for that access system shall be followed. This shall be sending of an LLC PDU in a GSM cell or initiating the SERVICE REQUEST procedure in a UMTS cell.

- If the MS is in a different access network, GSM or UMTS, as when it last sent user data or signalling messages, the normal or combined RA update procedure shall be performed depending on the network operation mode in the current RA, before the sending of user data or signalling messages. If the signalling message is a DETACH REQUEST containing cause "power off", the RA update procedure need not to be performed.

- If the periodic routing area update timer expires the MS shall initiate the periodic RA update procedure.

If the READY timer is not running in the network in GSM or the network is in PMM-IDLE mode in UMTS, then the network shall page the MS if down-link user data or signalling information needs to be sent from the network to the MS. This shall include both GSM and UMTS cells.

- If the MS receives the paging indication in the same access network, GSM or UMTS, as when it last sent user data or signalling information, the MS shall send any LLC PDU in a GSM cell or shall initiate the SERVICE REQUEST procedure indicating service type "paging response" in a UMTS cell.

- If the MS receives the paging indication in a different access network, GSM or UMTS, as when it last sent user data or signalling information, the normal or combined RA update procedure shall be performed depending on the network operation mode in the current RA.

c) Intersystem handover from GSM to UMTS during a CS connection:

After the successful completion of the handover from an GSM cell to an UMTS cell, an MS which has performed the GPRS suspension procedure in Gb mode (see 3GPP TS 44.018 [84]) (i.e. an MS in MS operation mode B or an DTM MS in a GSM cell that does not support DTM) shall perform a normal RA update procedure in the UMTS cell in order to resume the GPRS services in the network, before sending any other signalling messages or user data.

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, stops timer T3310 and for all causes except #12, #14 and #15 deletes the list of "equivalent PLMNs".

The MS shall then take 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 subclause 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, 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 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 subclause 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 (and shall store it according to subclause 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 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);

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 subclause 4.1.3.2), shall reset the GPRS attach attempt counter and shall change to state GMM-DEREGISTERED.

The MS shall store the PLMN identity in the "forbidden PLMN list".

If no RR connection exists, the MS shall perform the following additional actions immediately. If the MS is operating in MS operation mode A and an RR connection exists, the MS shall perform these actions when the RR connection is subsequently released:

- If the MS is IMSI attached, the MS shall 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 perform a PLMN selection according to 3GPP TS 23.122 [14].

12 (Location area not allowed);

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 clause 4.1.3.2) and shall reset the attach attempt counter. The state is changed to GMM-DEREGISTERED.LIMITED-SERVICE.

The mobile station shall store the LAI in the list of "forbidden location areas for regional provision of service".

If no RR connection exists, the MS shall perform the following additional actions immediately. If the MS is operating in MS operation mode A and an RR connection exists, the MS shall perform these actions when the RR connection is subsequently released:

- If the MS is IMSI attached, the MS shall 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 perform a cell selection according to 3GPP TS ~~03.22~~43.022 and 3GPP TS 25.304.

13 (Roaming not allowed in this 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 clause 4.1.3.2) and shall reset the attach attempt counter. The state is changed to GMM-DEREGISTERED.LIMITED-SERVICE or optionally to GMM-DEREGISTERED.PLMN-SEARCH.

The MS shall store the LAI in the list of "forbidden location areas for roaming".

If no RR connection exists, the MS shall perform the following additional actions immediately. If the MS is operating in MS operation mode A and an RR connection exists, the MS shall perform these actions when the RR connection is subsequently released:

- If the MS is IMSI attached, the MS shall 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 perform a PLMN selection according to 3GPP TS 23.122 [14].

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 subclause 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.

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 clause 4.1.3.2) and shall reset the attach attempt counter. The state is changed to GMM-DEREGISTERED.LIMITED-SERVICE.

The MS shall store the LAI in the list of "forbidden location areas for roaming".

If no RR connection exists, the MS shall perform the following additional actions immediately. If the MS is operating in MS operation mode A and an RR connection exists, the MS shall perform these actions when the RR connection is subsequently released:

- If the MS is IMSI attached, the MS shall 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 search for a suitable cell in another location area in the same PLMN according to 3GPP TS ~~03.22~~43.022 and 3GPP TS 25.304.

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

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 for all causes except #12, #14 and #15 deletes the list of "equivalent PLMNs".

The MS shall then take one of the following actions depending upon the reject cause:

3 (Illegal MS);

6 (Illegal ME), or

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 subclause 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.

7 (GPRS services not allowed);

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to subclause 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.

11 (PLMN not allowed);

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 subclause 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 PLMN identity in the "forbidden PLMN list".

The MS shall perform a PLMN selection according to 3GPP TS 23.122 [14].

12 (Location area not allowed);

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

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 in the list of "forbidden location areas for regional provision of service".

The MS shall perform a cell selection according to 3GPP TS ~~03.22~~43.022 and 3GPP TS 25.304.

13 (Roaming not allowed in this 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 clause 4.1.3.2) and shall reset the attach attempt counter. The state is changed to GMM-DEREGISTERED.LIMITED-SERVICE or optionally to GMM-DEREGISTERED.PLMN-SEARCH.

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 mobile station shall store the LAI in the list of "forbidden location areas for roaming".

The MS shall perform a PLMN selection according to 3GPP TS 23.122 [14].

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 subclause 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.

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 clause 4.1.3.2) and shall reset the attach attempt counter. The state is changed to GMM-DEREGISTERED.LIMITED-SERVICE.

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 in the list of "forbidden location areas for roaming".

The MS shall search for a suitable cell in another location area in the same PLMN according to 3GPP TS ~~03.22~~43.022 and 3GPP TS 25.304.

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

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 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. 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.

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 subclause 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.

When receiving the DETACH REQUEST message and the detach type IE indicates "re-attach not required" and the cause code is not "#2 (IMSI unknown in HLR)", 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.

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 subclause 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 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 subclause 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 shall store it according to subclause 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 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);

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 subclause 4.1.3.2). The new GMM state is GMM-DEREGISTERED.

The MS shall store the PLMN identity in the "forbidden PLMN list".

If no RR connection exists, the MS shall perform the following additional actions immediately. If the MS is operating in MS operation mode A and an RR connection exists, the MS shall perform these actions when the RR connection is subsequently released:

- A GPRS MS operating in MS operation mode A or B 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 MS shall perform a PLMN selection according to 3GPP TS 23.122 [14].

12 (Location area not allowed);

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

The MS shall store the LAI in the list of "forbidden location areas for regional provision of service".

If no RR connection exists, the MS shall perform the following additional actions immediately. If the MS is operating in MS operation mode A and an RR connection exists, the MS shall perform these actions when the RR connection is subsequently released:

- If the MS is IMSI attached, the MS shall 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 perform a cell selection according to 3GPP TS ~~03.22~~43.022 and 3GPP TS 25.304.

13 (Roaming not allowed in this 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 clause 4.1.3.2) and shall reset the attach attempt counter. The state is changed to GMM-DEREGISTERED.LIMITED-SERVICE or optionally to GMM-DEREGISTERED.PLMN-SEARCH.

The MS shall store the LAI in the list of "forbidden location areas for roaming".

If no RR connection exists, the MS shall perform the following additional actions immediately. If the MS is operating in MS operation mode A and an RR connection exists, the MS shall perform these actions when the RR connection is subsequently released:

- If the MS is IMSI attached, the MS shall 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 perform a PLMN selection according to 3GPP TS 23.122 [14].

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 subclause 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.

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 clause 4.1.3.2) and shall reset the attach attempt counter. The state is changed to GMM-DEREGISTERED.LIMITED-SERVICE.

The MS shall store the LAI in the list of "forbidden location areas for roaming".

If no RR connection exists, the MS shall perform the following additional actions immediately. If the MS is operating in MS operation mode A and an RR connection exists, the MS shall perform these actions when the RR connection is subsequently released:

- If the MS is IMSI attached, the MS shall 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 search for a suitable cell in another location area in the same PLMN according to 3GPP TS ~~03.22~~43.022 and 3GPP TS 25.304.

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

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, stops timer T3330, and for all causes except #12, #14 and #15 deletes the list of "equivalent PLMNs".

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 subclause 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, 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 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 subclause 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 subclause 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);

- 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 subclause 4.1.3.2) and enter the state GMM-DEREGISTERED.

  The MS shall store the PLMN identity in the "forbidden PLMN list".

  If no RR connection exists, the MS shall perform the following additional actions immediately. If the MS is operating in MS operation mode A and an RR connection exists, the MS shall perform these actions when the RR connection is subsequently released:

  - If the MS is IMSI attached, the MS shall 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 perform a PLMN selection according to 3GPP TS 23.122 [14].

12 (Location area not allowed);

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 clause 4.1.3.2), shall reset the routing area updating attempt counter and shall change to state GMM-DEREGISTERED.LIMITED-SERVICE.

The mobile station shall store the LAI in the list of "forbidden location areas for regional provision of service".

If no RR connection exists, the MS shall perform the following additional actions immediately. If the MS is operating in MS operation mode A and an RR connection exists, the MS shall perform these actions when the RR connection is subsequently released:

- If the MS is IMSI attached, the MS shall 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 perform a cell selection according to 3GPP TS ~~03.22~~43.022 and 3GPP TS 25.304.

13 (Roaming not allowed in this location area);

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to clause 4.1.3.2) shall reset the routing area updating attempt counter and shall change to state GMM-REGISTERED.LIMITED-SERVICE.

The MS shall store the LAI in the list of "forbidden location areas for roaming".

If no RR connection exists, the MS shall perform the following additional actions immediately. If the MS is operating in MS operation mode A and an RR connection exists, the MS shall perform these actions when the RR connection is subsequently released:

- If the MS is IMSI attached, the MS shall set the update status to U3 ROAMING NOT ALLOWED and shall reset the location update attempt counter. The new MM state is MM IDLE.

- The MS shall perform a PLMN selection according to 3GPP TS 23.122 [14].

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 subclause 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.

15 (No Suitable Cells In Location Area);

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to clause 4.1.3.2) shall reset the routing area updating attempt counter and shall change to state GMM-REGISTERED.LIMITED-SERVICE.

The MS shall store the LAI in the list of "forbidden location areas for roaming".

If no RR connection exists, the MS shall perform the following additional actions immediately. If the MS is operating in MS operation mode A and an RR connection exists, the MS shall perform these actions when the RR connection is subsequently released:

- If the MS is IMSI attached, the MS shall set the update status to U3 ROAMING NOT ALLOWED and shall reset the location update attempt counter. The new MM state is MM IDLE.

- The MS shall search for a suitable cell in another location area in the same PLMN according to 3GPP TS ~~03.22~~43.022 and 3GPP TS 25.304.

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

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.

4.7.5.2.4 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, enters state MM IDLE, and for all causes except #12, #14 and #15 deletes the list of "equivalent PLMNs".

The MS shall then take different actions depending on the received reject cause:

3 (Illegal MS);

6 (Illegal ME), or

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 subclause 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.

7 (GPRS services not allowed);

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to subclause 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.

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 subclause 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);

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 subclause 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 PLMN identity in the "forbidden PLMN list".

The MS shall then perform a PLMN selection according to 3GPP TS 23.122 [14].

12 (Location area not allowed);

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 clause 4.1.3.2), shall reset the routing area updating attempt counter and shall change to state GMM-DEREGISTERED.LIMITED-SERVICE.

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 mobile station shall store the LAI in the list of "forbidden location areas for regional provision of service".

The MS shall perform a cell selection according to 3GPP TS ~~03.22~~43.022 and 3GPP TS 25.304.

13 (Roaming not allowed in this location area);

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to clause 4.1.3.2), shall reset the routing area updating attempt counter and shall change to state GMM-REGISTERED.LIMITED-SERVICE.

The MS shall in addition set the update status to U3 ROAMING NOT ALLOWED and shall reset the location update attempt counter. The new MM state is MM IDLE.

The MS shall store the LAI in the list of "forbidden location areas for roaming".

The MS shall perform a PLMN selection according to 3GPP TS 23.122 [14].

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 subclause 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.

15 (No Suitable Cells In Location Area);

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to clause 4.1.3.2), shall reset the routing area updating attempt counter and shall change to state GMM-REGISTERED.LIMITED-SERVICE.

The MS shall in addition set the update status to U3 ROAMING NOT ALLOWED and shall reset the location update attempt counter. The new MM state is MM IDLE.

The MS shall store the LAI in the list of "forbidden location areas for roaming".

The MS shall search for a suitable cell in another location area in the same PLMN according to 3GPP TS ~~03.22~~43.022 and 3GPP TS 25.304.

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

4.7.6.3 P-TMSI reallocation completion by the network

Upon receipt of the P-TMSI REALLOCATION COMPLETE message, the network stops the timer T3350 and considers both the old and the 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 subclause 4.7.1.5).

In GSM, the GMM layer shall notify the LLC layer that the P-TMSI has been changed (see 3GPP TS ~~04.64~~44.064 [78a] ~~[76]~~).

4.7.7.2 Authentication and ciphering response by the MS

In GSM, a MS that is attached to GPRS shall be ready to respond upon an AUTHENTICATION AND CIPHERING REQUEST message at any time.

In UMTS, an MS that is attached to GPRS shall be ready to respond upon an AUTHENTICATION AND CIPHERING REQUEST message at any time whilst a PS signalling connection exists.

A MS which does not support the UMTS authentication algorithm shall ignore the Authentication Parameter AUTN IE if included in the AUTHENTICATION AND CIPHERING REQUEST message and perform the GSM authentication challenge. It shall not perform the authentication of the network described in 4.7.7.5.1.

In a GSM authentication challenge, if the AUTHENTICATION AND CIPHERING REQUEST message includes the authentication parameters RAND and GPRS CKSN, then upon receipt of the message, the MS processes the challenge information and sends an AUTHENTICATION AND CIPHERING RESPONSE message to the network. The value of the received A&C reference number information element shall be copied into the A&C reference number information element in the AUTHENTICATION AND CIPHERING RESPONSE message. A GSM authentication challenge will result in the SIM passing a SRES and a GPRS GSM ciphering key to the ME. The new GPRS GSM ciphering key calculated from the challenge information shall overwrite the previous one and any previously stored GPRS UMTS ciphering and GPRS UMTS integrity keys shall be deleted. The calculated GSM ciphering key shall be stored on the SIM together with the GPRS ciphering key sequence number before the AUTHENTICATION AND CIPHERING RESPONSE message is transmitted.

In a UMTS authentication challenge, if the AUTHENTICATION AND CIPHERING REQUEST message includes the UMTS authentication parameters GPRS CKSN, RAND and AUTN, then upon receipt of the message, the MS verifies the AUTN parameter and if this is accepted, the MS processes the challenge information and sends an AUTHENTICATION AND CIPHERING RESPONSE message to the network. The value of the received A&C reference number information element shall be copied into the A&C reference number information element in the AUTHENTICATION AND CIPHERING RESPONSE message. A UMTS authentication challenge will result in the SIM passing a RES, a GPRS UMTS ciphering key, a GPRS UMTS integrity key and a GPRS GSM ciphering key to the

ME. The new GPRS UMTS ciphering key, GPRS UMTS integrity key and GPRS GSM ciphering key calculated from the challenge information shall overwrite the previous ones. The new GPRS UMTS ciphering key, GPRS UMTS integrity key and GPRS GSM ciphering key shall be stored on the SIM together with the GPRS ciphering key sequence number before the AUTHENTICATION AND CIPHERING RESPONSE message is transmitted.

In UMTS, an MS capable of UMTS only shall ignore the Ciphering Algorithm IE in the AUTHENTICATION AND CIPHERING REQUEST message. An MS capable of both UMTS and GSM shall store the received value in the Ciphering Algorithm IE in the AUTHENTICATION AND CIPHERING REQUEST message in order to use it at an inter system change from UMTS to GSM.

If the AUTHENTICATION AND CIPHERING REQUEST message does not include neither the GSM authentication parameters (RAND and GPRS CKSN) nor the UMTS authentication parameters (RAND, AUTN and GPRS CKSN), then upon receipt of the message, the MS replies by sending an AUTHENTICATION AND CIPHERING RESPONSE message to the network.

In GSM, the GMM layer shall notify the LLC layer if ciphering shall be used or not and if yes which GSM ciphering algorithm and GPRS GSM ciphering key that shall be used (see 3GPP TS ~~04.64~~44.064 [78a] ~~[76]~~).

A mobile station supporting UMTS authentication challenge shall support the following procedure:

In order to avoid a synchronisation failure, if the same RAND is received twice, the mobile station shall store the received RAND and the RES returned from the SIM in the volatile memory and compare it with any subsequently received RAND values, until the RAND value stored in the mobile station is deleted. If the stored RAND value is equal to the new received value in the AUTHENTICATION & CIPHERING REQUEST message, then the mobile station shall not pass the RAND to the SIM, but shall immediately send the AUTHENTICATION & CIPHERING RESPONSE message with the stored RES. If there is no valid stored RAND in the mobile station or the stored RAND is different from the new received value in the AUTHENTICATION & CIPHERING REQUEST message, the mobile station shall pass the RAND to the SIM, shall override any previously stored RAND and RES with the new ones and reset and restart timer T3316.

The RAND and RES values stored in the mobile station shall be deleted:

- upon receipt of a SECURITY MODE COMMAND (Iu mode only) or AUTHENTICATION & CIPHERING REJECT message;
- upon expiry of timer T3316; or
- if the mobile station enters the GMM states GMM-DEREGISTERED or GMM-NULL.

4.7.7.3 Authentication and ciphering completion by the network

Upon receipt of the AUTHENTICATION AND CIPHERING RESPONSE message, the network stops the timer T3360 and checks the validity of the response (see 3GPP TS 43.020 [13] and 3GPP TS 33.102). For this, it may use the A&C reference number information element within the AUTHENTICATION AND CIPHERING RESPONSE message to determine whether the response is correlating to the last request that was sent.

In GSM, the GMM layer shall notify the LLC sublayer if ciphering shall be used or not and if yes which algorithm and GPRS GSM ciphering key that shall be used (see 3GPP TS ~~04.64~~44.064 [78a] ~~[76]~~).

Upon receipt of the AUTHENTICATION AND CIPHERING FAILURE message, the network stops the timer T3360. In Synch failure case, the core network may renegotiate with the HLR/AuC and provide the MS with new authentication parameters.

4.7.7.8 Handling of keys at intersystem change from UMTS to GSM

At an intersystem change from UMTS to GSM, ciphering may be started (see 3GPP TS ~~04.64~~44.064 [78a] ~~[76]~~) without any new authentication and ciphering procedure. Deduction of the appropriate security key for ciphering in GSM, depends on the current GSM/UMTS security context stored in the MS and the network.

The ME shall handle the GPRS GSM ciphering key according to table 4.7.7.8.1.

Before any initial GMM message is sent in the new cell in GSM, the GMM layer in the MS shall notify the LLC layer if ciphering shall be used or not. If yes, the GPRS GSM ciphering key and the applicable ciphering algorithm according to the stored *Ciphering Algorithm IE* in the MS shall also be indicated to the LLC layer (see 3GPP TS ~~04.64~~44.064 [78a] ~~[76]~~).

Table 4.7.7.8.1/3GPP TS 24.008: Intersystem change from UMTS to GSM

Security context established in MS and network in UMTS	At intersystem change to GSM:
GSM security context	An ME shall apply the GPRS GSM cipher key received from the GSM security context residing in the SIM.
UMTS security context	An ME shall apply the GPRS GSM cipher key derived by the SIM from the GPRS UMTS cipher key and the GPRS UMTS integrity key.

NOTE A SIM with UMTS security context, passes the GPRS UMTS ciphering key, the GPRS UMTS integrity key and the derived GPRS GSM ciphering key to the ME independent on the current radio access being UMTS or GSM.

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 subclause 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 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 subclause 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 subclause 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);

- 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 subclause 4.1.3.2) and enter the state GMM-DEREGISTERED.

- The MS shall store the PLMN identity in the "forbidden PLMN list".

- If no RR connection exists, the MS shall perform the following additional actions immediately. If the MS is operating in MS operation mode A and an RR connection exists, the MS shall perform these actions when the RR connection is subsequently released:

  - A GPRS MS operating in MS operation mode A 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 MS shall perform a PLMN selection according to 3GPP TS 23.122 [14].

12 (Location area not allowed);

- 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 subclause 4.1.3.2) and shall change to state GMM-DEREGISTERED.LIMITED-SERVICE.

- The mobile station shall store the LAI in the list of "forbidden location areas for regional provision of service".

- If no RR connection exists, the MS shall perform the following additional actions immediately. If the MS is operating in MS operation mode A and an RR connection exists, the MS shall perform these actions when the RR connection is subsequently released:

  - If the MS is IMSI attached, the MS shall 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 perform a cell selection according to 3GPP TS ~~03.22~~43.022 and 3GPP TS 25.304.

13 (Roaming not allowed in this location area);

- The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to subclause 4.1.3.2) and shall change to state GMM-REGISTERED.LIMITED-SERVICE.

- The MS shall store the LAI in the list of "forbidden location areas for roaming".

- If no RR connection exists, the MS shall perform the following additional actions immediately. If the MS is operating in MS operation mode A and an RR connection exists, the MS shall perform these actions when the RR connection is subsequently released:

  - If the MS is IMSI attached, the MS shall set the update status to U3 ROAMING NOT ALLOWED and shall reset the location update attempt counter. The new MM state is MM IDLE.

  - The MS shall perform a PLMN selection according to 3GPP TS 23.122 [14].

15 (No Suitable Cells In Location Area);

- The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to subclause 4.1.3.2) and shall change to state GMM-REGISTERED.LIMITED-SERVICE.

- The MS shall store the LAI in the list of "forbidden location areas for roaming".

- If no RR connection exists, the MS shall perform the following additional actions immediately. If the MS is operating in MS operation mode A and an RR connection exists, the MS shall perform these actions when the RR connection is subsequently released:

  - If the MS is IMSI attached, the MS shall set the update status to U3 ROAMING NOT ALLOWED and shall reset the location update attempt counter. The new MM state is MM IDLE.

  - The MS shall search for a suitable cell in another location area in the same PLMN according to 3GPP TS ~~03.22~~43.022 and 3GPP TS 25.304.

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 subclause 4.7.13.5.

5.2.1.10 Call queuing at mobile originating call establishment

~~The conditions to apply queuing are described in 3GPP TS 03.01 [9].~~

If an idle traffic channel is not available at the assignment instant, the network may place the traffic channel request in a queue. Calls arriving when all positions in the queue are occupied shall be cleared by the network using the cause #34 "no circuit/channel available".

The maximum queuing interval is supervised by the network. The limit is a network dependent choice. In case the network is not able to allocate a traffic channel within the queuing limit, the network will release the call using cause #34 "no circuit/channel available".

Optionally, e.g. if eMLPP is used, the network may decide to pre-empt existing calls or to place the traffic channel request at some preferential position within the queue.

Specific indications provided in the network to the remote user are a network dependent choice.

5.2.2.3.3 Call failure procedures

In case of abnormal behaviour the following call failure procedures apply:

i. If the network does not receive any response to the SETUP message prior to the expiration of timer T303, then the network shall: initiate clearing procedures towards the calling user with cause #18 "no user responding"; and initiate clearing procedures towards the called mobile station in accordance with subclause 5.4.4 using cause #102 "recovery on timer expiry".

ii. If the network has received a CALL CONFIRMED message, but does not receive an ALERTING, CONNECT or DISCONNECT message prior to the expiration of timer T310, then the network shall:

   - initiate clearing procedures towards the calling user with cause #18 "no user responding"; and

   - initiate clearing procedures towards the called MS in accordance with subclause 5.4.4 using cause #102 "recovery on timer expiry".

iii. If the network has received an ALERTING message, but does not receive a CONNECT or DISCONNECT message prior to the expiry of timer T301 (or a corresponding internal alerting supervision timing function), then the network shall: initiate clearing procedures towards the calling user with cause #19 "user alerting, no answer"; and initiate clearing procedures towards the called mobile station in accordance with subclause 5.4.4, using cause #102 "recovery on timer expiry" or using cause #31 "normal, unspecified".

NOTE: The choice between cause #31 and cause #102 may have consequences on indications generated by the mobile station, see 3GPP TS ~~02.40~~22.001 [8a].

6.1.2 Session management states

In this subclause, the SM states are described for one SM entity (see 3GPP TS 24.007 [20]). Each SM entity is associated with one PDP context. Subclause 6.1.2.1 describes the SM states in the MS and subclause 6.1.2.2 describes the SM states on the network side.

7 Examples of structured procedures

See 3GPP TS 23.108 [9a].

8 Handling of unknown, unforeseen, and erroneous protocol data

8.1 General

The procedures specified in 3GPP TS 24.008 and call-related supplementary service handling in 3GPP TS 24.010 [21] apply to those messages which pass the checks described in this subclause.

This subclause also specifies procedures for the handling of unknown, unforeseen, and erroneous protocol data by the receiving entity. These procedures are called "error handling procedures", but in addition to providing recovery mechanisms for error situations they define a compatibility mechanism for future extensions of the protocols.

Error handling concerning the value part of the Facility IE and of the SS Version Indicator IE are not in the scope of the present document. It is defined in 3GPP TS 24.010 [21] and the 3GPP TS 24~~04~~.08x series.

Sub subclauses 8.1 to 8.8 shall be applied in order of precedence.

Most error handling procedures are mandatory for the mobile station.

Detailed error handling procedures in the network are implementation dependent and may vary from PLMN to PLMN. However, when extensions of this protocol are developed, networks will be assumed to have the error handling that is indicated in this subclause as mandatory ("shall") and that is indicated as strongly recommended ("should"). Subclauses 8.2, 8.3, 8.4, 8.5 and 8.7.2 do not apply to the error handling in the network applied to the receipt of initial layer 3 message: If the network diagnoses an error described in one of these subclause s in the initial layer 3 message received from the mobile station, it shall either:

- try to recognize the classmark and then take further implementation dependent actions; or
- release the RR-connection.

Also, the error handling of the network is only considered as mandatory or strongly recommended when certain thresholds for errors are not reached during a dedicated connection.

For definition of semantical and syntactical errors see 3GPP TS 24.007 [20], subclause 11.4.2.

8.8 Messages with semantically incorrect contents

When a message with semantically incorrect contents is received, the foreseen reactions of the procedural part of 3GPP TS 24.008 (i.e. of clauses 3, 4, 5) are performed. If however no such reactions are specified, the MS shall ignore the message except for the fact that, if an RR connection exists, it returns a status message (STATUS, or MM STATUS depending on the PD) with cause value # 95 "semantically incorrect message".

The network should follow the same procedure except that a status message is not normally transmitted.

Semantic checking of the Facility information element value part (defined in 3GPP TS 24.080 [24]) is the subject of the technical specifications 3GPP TS 24.010 [21] and the 3GPP TS ~~04.8~~24.08x series.

9.3.23 Setup

9.3.23.1 Setup (mobile terminated call establishment)

This message is sent by the network to the mobile station to initiate a mobile terminated call establishment.

See table 9.70/3GPP TS 24.008.

Message type: SETUP

Significance: global

Direction: network to mobile station

Table 9.70/3GPP TS 24.008: SETUP 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
	Setup Message type	Message type 10.4	M	V	1
D-	BC 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
34	Signal	Signal 10.5.4.23	O	TV	2
5C	Calling party BCD Number	Calling party BCD num. 10.5.4.9	O	TLV	3-14
5D	Calling party sub-Address	Calling party subaddr. 10.5.4.10	O	TLV	2-23
5E	Called party BCD Number	Called party BCD num. 10.5.4.7	O	TLV	3-19
6D	Called party sub-Address	Called party subaddr. 10.5.4.8	O	TLV	2-23
74	Redirecting party BCD number	Redirecting party BCD num. 10.5.4.21a	O	TLV	3-19
75	Redirecting party sub-address	Redirecting party subaddress. 10.5.4.21b	O	TLV	2-23
D-	LLC repeat indicator	Repeat indicator 10.5.4.22	O	TV	1
7C	Low layer Compatibility I	Low layer comp. 10.5.4.18	O	TLV	2-18
7C	Low layer Compatibility II	Low layer comp. 10.5.4.18	C	TLV	2-18
D-	HLC repeat indicator	Repeat indicator 10.5.4.22	O	TV	1
7D	High layer Compatibility i	High layer comp. 10.5.4.16	O	TLV	2-5
7D	High layer Compatibility ii	High layer comp. 10.5.4.16	C	TLV	2-5
7E	User-user	User-user 10.5.4.25	O	TLV	3-35
8-	Priority	Priority Level 10.5.1.11	O	TV	1
19	Alert	Alerting Pattern 10.5.4.26	O	TLV	3
2F	Network Call Control Capabilities	Network Call Control cap. 10.5.4.29	O	TLV	3
3A	Cause of No CLI	Cause of No CLI 10.5.4.30	O	TLV	3

9.3.23.1.1 BC repeat indicator

The *BC repeat indicator* information element is included if and only if *bearer capability* 1 information element and *bearer capability 2* IE are both present in the message.

9.3.23.1.2 Bearer capability 1 and bearer capability 2

The *bearer capability 1* information element may be omitted in the case where the mobile subscriber is allocated only one directory number for all services (ref.: 3GPP TS 29.007 [38]). The *bearer capability 2* IE is missing at least if the *bearer capability 1* IE is missing.

If the MSC wishes to indicate capability for an altenative call mode, which can be entered through fallback, this is indicated by adding a *bearer capability information ele*ment (bearer capability) 2 element (see subclause 5.3.6).

9.3.23.1.3 Facility

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

9.3.23.1.4 Progress indicator

This information element is 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 MS attach the user connection for speech.

9.3.23.1.4a Called party BCD number

For all bands except for PCS1900, the maximum length of this IE sent by the network shall be 13 octets

9.3.23.1.5 Called party subaddress

Included in the Network-to-mobile station direction if the calling user includes a *called party subaddress* information element in the SETUP message.

9.3.23.1.6 LLC repeat indicator

The *LLC repeat indicator* information element is included if and only if both following conditions hold:

- The *BC repeat indicator* IE is contained in the message.
- The *low layer compatibility I* IE is contained in the message.

If included, the *LLC repeat indicator* shall specify the same repeat indication as the *BC repeat indicator* IE.

9.3.23.1.7 Low layer compatibility I

Included in the network-to-mobile station direction if the calling user specified a low layer compatibility.

9.3.23.1.8 Low layer compatibility II

Included if and only if the *LLC repeat indicator* information element is contained in the message.

9.3.23.1.9 HLC repeat indicator

The *HLC repeat indicator* information element is included if and only both following conditions hold:

- The *BC repeat indicator* IE is contained in the message.
- The *high layer compatibility i* IE is contained in the message.

If included, the *HLC repeat indicator* shall specify the same repeat indication as the *BC repeat indicator* IE.

9.3.23.1.10 High layer compatibility i

Included in the network-to-mobile station direction if the calling user specified a high layer compatibility.

9.3.23.1.11 High layer compatibility ii

Included if and only if the *HLC repeat indicator* information element is contained in the message.

9.3.23.1.12 User-user

May be included in the network to called mobile station direction when the calling remote user included a user-user information element in the SETUP message.

9.3.23.1.13 Redirecting party BCD number

May be included in the network to called mobile station direction when the call has been redirected.

9.3.23.1.14 Redirecting party subaddress

May be included in the network to called mobile station direction when the calling remote user included a called party subaddress in the SETUP message and the call has been redirected

9.3.23.1.15 Priority

May be included by the network to indicate the priority of the incoming call if eMLPP is used.

9.3.23.1.16 Alert $(Network Indication of Alerting in the MS)$

May be included by the network to give some indication about alerting (category or level). If supported in the MS, this optional indication is to be used by the MS as specified in 3GPP TS ~~02.07~~22.101 [8].

9.3.23.1.17 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.

9.3.23.1.18 Cause of No CLI

This IE may be included by the network as defined by 3GPP TS 24.081 [25].

When both Calling Party BCD number IE and Cause of No CLI IE are included in SETUP message then the Cause of No CLI IE provideds additional information on why the number digits are not present.

10.1 Overview

Within the Layer 3 protocols defined in 3GPP TS 24.0~~1~~08, every message is a standard L3 message as defined in 3GPP TS 24.007 [20]. This means that the message consists of the following parts:

a) protocol discriminator;

b) transaction identifier;

c) message type;

d) other information elements, as required.

This organization is illustrated in the example shown in figure 10.1/3GPP TS 24.008.

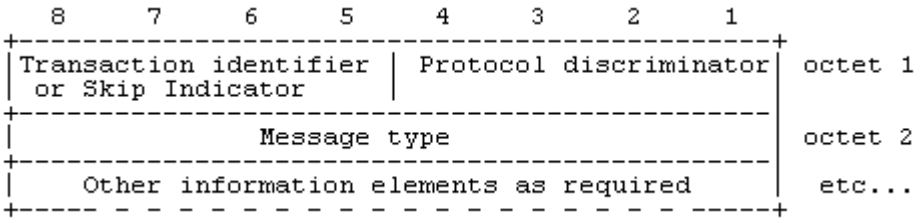

Figure 10.1/3GPP TS 24.008 General message organization example

Unless specified otherwise in the message descriptions of clause 9, a particular information element shall not be present more than once in a given message.

The term "default" implies that the value defined shall be used in the absence of any assignment, or that this value allows negotiation of alternative values in between the two peer entities.

When a field extends over more than one octet, the order of bit values progressively decreases as the octet number increases. The least significant bit of the field is represented by the lowest numbered bit of the highest numbered octet of the field.

10.5.1.6 Mobile Station Classmark 2

The purpose of the *Mobile Station Classmark 2* information element is to provide the network with information concerning aspects of both high and low priority of the mobile station equipment. This affects the manner in which the network handles the operation of the mobile station. The Mobile Station Classmark information indicates general mobile station characteristics and it shall therefore, except for fields explicitly indicated, be independent of the frequency band of the channel it is sent on.

The *Mobile Station Classmark 2* information element is coded as shown in figure 10.5.6/3GPP TS 24.008, table 10.5.6a/3GPP TS 24.008 and table 10.5.6b/3GPP TS 24.008.

The *Mobile Station Classmark 2* is a type 4 information element with 5 octets length.

8	7	6	5	4	3	2	1	
	Mobile station classmark 2 IEI							octet 1
Length of mobile station classmark 2 contents								octet 2
0 spare	Revision level		ES IND	A5/1	RF power capability			octet 3
0 spare	PS capa.	SS Screen. Indicator		SM ca pabi.	VBS	VGCS	FC	octet 4
CM3	0 spare	LCSVA CAP	UCS2	SoLSA	CMSP	A5/3	A5/2	octet 5

NOTE: Owing to backward compatibility problems, bit 8 of octet 4 should not be used unless it is also checked that the bits 8, 7 and 6 of octet 3 are not "0 0 0".

Figure 10.5.6/3GPP TS 24.008 *Mobile Station Classmark 2* information element

Table 10.5.6a/3GPP TS 24.008: *Mobile Station Classmark 2* information element

Revision level (octet 3)
Bits
7 6
0 0 Reserved for GSM phase 1
0 1 Used by GSM phase 2 mobile stations
1 0 Used by mobile stations supporting R99 or later versions of the protocol
1 1 Reserved for future use

ES IND (octet 3, bit 5) "Controlled Early Classmark Sending" option implementation
AN MS not supporting GSM shall set this bit to '0'.
An MS supporting GSM shall indicate the associated GSM capability (see table):

0 "Controlled Early Classmark Sending" option is not implemented in the MS
1 "Controlled Early Classmark Sending" option is implemented in the MS

NOTE: The value of the ES IND gives the implementation in the MS. It's value is **not** dependent on the broadcast SI 3 Rest Octet <Early Classmark Sending Control> value

A5/1 algorithm supported (octet 3, bit 4)
An MS not supporting GSM shall set this bit to '1'.
An MS supporting GSM shall indicate the associated GSM capability (see table)

0 encryption algorithm A5/1 available
1 encryption algorithm A5/1 not available

RF Power Capability (Octet 3)
When GSM 450, GSM 480, GSM 700, GSM 850, GSM 900 P, E [or R] band is used (for exceptions see 3GPP TS 44.018), the MS shall indicate the RF power capability of the band used (see table).
When UMTS is used, a single band GSM 450, GSM 480, GSM 700, GSM 850, GSM 900 P, E [or R] MS shall indicate the RF power capability corresponding to the (GSM) band it supports (see table). In this case, information on which single band is supported is found in classmark 3.
Bits
3 2 1
0 0 0 class 1
0 0 1 class 2
0 1 0 class 3
0 1 1 class 4
1 0 0 class 5
All other values are reserved.

When the DCS 1800 or PCS 1900 band is used (for exceptions see 3GPP TS 44.018) The MS shall indicate the RF power capability of the band used (see table).
When UMTS is used, a single band DCS 1800 or PCS 1900 MS shall indicate the RF power capability corresponding to the (GSM) band it supports (see table). In this case, information on which single band is supported is found in classmark 3
Bits
3 2 1
0 0 0 class 1
0 0 1 class 2
0 1 0 class 3
All other values are reserved.

When UMTS is used, an MS not supporting any GSM band or a multiband GSM MS shall code this field as follows (see table):
Bits
3 2 1
1 1 1 RF Power capability is irrelevant in this information element
All other values are reserved.

Table 10.5.6a/3GPP TS 24.008: *Mobile Station Classmark 2* information element

PS capability (pseudo-synchronization capability) (octet 4)
An MS not supporting GSM shall set this bit to '0'.
An MS supporting GSM shall indicate the associated GSM capability (see table):
Bit **7**
0 PS capability not present
1 PS capability present

SS Screening Indicator (octet 4)
Bits
6 5
0 0 defined in 3GPP TS 24.080
0 1 defined in 3GPP TS 24.080
1 0 defined in 3GPP TS 24.080
1 1 defined in 3GPP TS 24.080

SM capability (MT SMS pt to pt capability) (octet 4)
Bit **4**
0 Mobile station does not support mobile terminated point to point SMS
1 Mobile station supports mobile terminated point to point SMS

VBS notification reception (octet 4)
An MS not supporting GSM shall set this bit to '0'.
An MS supporting GSM shall indicate the associated GSM capability (see table):
Bit **3**
0 no VBS capability or no notifications wanted
1 VBS capability and notifications wanted

VGCS notification reception (octet 4)
An MS not supporting GSM shall set this bit to '0'.
An MS supporting GSM shall indicate the associated GSM capability (see table):
Bit **2**
0 no VGCS capability or no notifications wanted
1 VGCS capability and notifications wanted

FC Frequency Capability (octet 4)
When the GSM 400, or GSM 700, or GSM 850, or DCS 1800, or PCS 1900 band or UMTS is used (for exceptions see 3GPP TS 44.018), for definitions of frequency band see 3GPP TS 45.005), this bit shall be sent with the value '0'.

Note: This bit conveys no information about support or non support of the E-GSM or R-GSM bands when GSM 400, GSM 700, GSM 850, DCS 1800, PCS 1900 band or UMTS is used.

When a GSM 900 band is used (for exceptions see 3GPP TS 44.018):
Bit **1**
0 The MS does not support the E-GSM or R-GSM band (For definition of frequency bands see 3GPP TS 45.005 [33])
1 The MS does support the E-GSM or R-GSM (For definition of frequency bands see 3GPP TS 45.005 [33])
NOTE: For mobile station supporting the R-GSM band further information can be found in MS Classmark 3.

Table 10.5.6a/3GPP TS 24.008: *Mobile Station Classmark 2* information element

CM3 (octet 5, bit 8) 0 The MS does not support any options that are indicated in CM3 1 The MS supports options that are indicated in classmark 3 IE LCS VA capability (LCS value added location request notification capability) (octet 5,bit 6) 0 LCS value added location request notification capability not supported 1 LCS value added location request notification capability supported UCS2 treatment (octet 5, bit 5) This information field indicates the likely treatment by the mobile station of UCS2 encoded character strings. For backward compatibility reasons, if this field is not included, the value 0 shall be assumed by the receiver. 0 the ME has a preference for the default alphabet (defined in 3GPP TS ~~03.38~~23.038 [8b]) over UCS2. 1 the ME has no preference between the use of the default alphabet and the use of UCS2.
SoLSA (octet 5, bit 4) An MS not supporting GSM shall set this bit to '0'. An MS supporting GSM shall indicate the associated GSM capability (see table): 0 The ME does not support SoLSA. 1 The ME supports SoLSA. CMSP: CM Service Prompt (octet 5, bit 3) $(CCBS)$ 0 "Network initiated MO CM connection request" not supported. 1 "Network initiated MO CM connection request" supported for at least one CM protocol. A5/3 algorithm supported (octet 5, bit 2) An MS not supporting GSM shall set this bit to '0'. An MS supporting GSM shall indicate the associated GSM capability (see table): 0 encryption algorithm A5/3 not available 1 encryption algorithm A5/3 available A5/2 algorithm supported (octet 5, bit 1) An MS not supporting GSM shall set this bit to '0'. An MS supporting GSM shall indicate the associated GSM capability (see table): 0 encryption algorithm A5/2 not available 1 encryption algorithm A5/2 available

NOTE: Additional mobile station capability information might be obtained by invoking the classmark interrogation procedure when GSM is used.

10.5.1.7 Mobile Station Classmark 3

The purpose of the *Mobile Station Classmark 3* information element is to provide the network with information concerning aspects of the mobile station. The contents might affect the manner in which the network handles the operation of the mobile station. The Mobile Station Classmark information indicates general mobile station characteristics and it shall therefore, except for fields explicitly indicated, be independent of the frequency band of the channel it is sent on.

The *MS Classmark 3* is a type 4 information element with a maximum of 14 octets length.

The value part of a *MS Classmark 3* information element is coded as shown in figure 10.5.7/3GPP TS 24.008 and table 10.5.7/3GPP TS 24.008.

NOTE: The 14 octet limit is so that the CLASSMARK CHANGE message will fit in one layer 2 frame.

SEMANTIC RULE: a multiband mobile station shall provide information about all frequency bands it can support. A single band mobile station shall not indicate the band it supports in the *Multiband Supported, GSM 400 Bands Supported, GSM 700 Associated Radio Capability, GSM 850 Associated Radio Capability* or PCS *1900 Associated Radio Capability* fields in the MS Classmark 3. Due to shared radio frequency channel numbers between DCS 1800 and PCS 1900, the mobile should indicate support for either DCS 1800 band OR PCS 1900 band.

SEMANTIC RULE: a mobile station shall include the MS Measurement Capability field if the *Multi Slot Class* field contains a value of 19 or greater (see 3GPP TS 45.002 [32]).

Typically, the number of spare bits at the end is the minimum to reach an octet boundary. The receiver may add any number of bits set to "0" at the end of the received string if needed for correct decoding.

```
<Classmark 3 Value part> ::=
    < spare bit >
    {    < Multiband supported : { 000 } >
             < A5 bits >
    |    < Multiband supported : { 101 | 110 } >
             < A5 bits >
             < Associated Radio Capability 2 : bit(4) >
             < Associated Radio Capability 1 : bit(4) >
    |    < Multiband supported : { 001 | 010 | 100 } >
             < A5 bits >
             < spare bit >(4)
             < Associated Radio Capability 1 : bit(4) > }
    { 0 | 1 < R Support > }
    { 0 | 1 < Multi Slot Capability > }
    < UCS2 treatment: bit >
    < Extended Measurement Capability : bit >
    { 0 | 1 < MS measurement capability > }
    { 0 | 1 < MS Positioning Method Capability > }
    { 0 | 1 < EDGE Multi Slot Capability > }
    { 0 | 1 < EDGE Struct > }
    { 0 | 1 < GSM 400 Bands Supported : { 01 | 10 | 11 } >
             < GSM 400 Associated Radio Capability: bit(4) > }

    { 0 | 1 <GSM 850 Associated Radio Capability : bit(4) > }
    { 0 | 1 <PCS 1900 Associated Radio Capability : bit(4) > }
    < UMTS FDD Radio Access Technology Capability : bit >
    < UMTS 3.84 Mcps TDD Radio Access Technology Capability : bit >
    < CDMA 2000 Radio Access Technology Capability : bit >

    { 0 | 1  < DTM GPRS Multi Slot Class : bit(2) >
             < MAC Mode Support : bit >
             {0 | 1< DTM EGPRS Multi Slot Class : bit(2) > } }
    { 0 | 1 < Single Band Support > } -- Release 4 starts here:
    { 0 | 1 <GSM 700 Associated Radio Capability : bit(4)>}

    < UMTS 1.28 Mcps TDD Radio Access Technology Capability : bit >
    < GERAN Feature Package 1 : bit >

    { 0 | 1 < Extended DTM GPRS Multi Slot Class : bit(2) >
             < Extended DTM EGPRS Multi Slot Class : bit(2) > }

    < spare bit > ;

< A5 bits > ::=
    < A5/7 : bit > < A5/6 : bit > < A5/5 : bit > < A5/4 : bit >  ;

<R Support>::=
    < R-GSM band Associated Radio Capability : bit(3) > ;

< Multi Slot Capability > ::=
    < Multi Slot Class : bit(5) >  ;

< MS Measurement capability > ::=
    < SMS_VALUE : bit (4) >
    < SM_VALUE : bit (4) > ;

< MS Positioning Method Capability > ::=
    < MS Positioning Method : bit(5) > ;

< EDGE Multi Slot Capability > ::=
    < EDGE Multi Slot Class : bit(5) > ;

 <EDGE Struct> : :=
    < Modulation Capability : bit >
    { 0 | 1 < EDGE RF Power Capability 1: bit(2) > }
    { 0 | 1 < EDGE RF Power Capability 2: bit(2) > }
```

```
< Single Band Support > ::=
    < GSM Band : bit (4) > ;
```

Figure 10.5.7/3GPP TS 24.008 *Mobile Station Classmark 3* information element

Table 10.5.7/3GPP TS 24.008: *Mobile Station Classmark 3* information element

Multiband Supported (3 bit field)

Band 1 supported (third bit of the field)
Bit 3
0 P-GSM not supported
1 P-GSM supported

Band 2 supported (second bit of the field)
BIT 2
0 E-GSM or R-GSM not supported
1 E-GSM or R-GSM supported

Band 3 supported (first bit of the field)
Bit 1
0 DCS 1800 not supported
1 DCS 1800 supported

The indication of support of P-GSM band or E-GSM or R-GSM band is mutually exclusive.

When the 'Band 2 supported' bit indicates support of E-GSM or R-GSM, the presence of the <R Support> field, see below, indicates if the E-GSM or R-GSM band is supported.

In this version of the protocol, the sender indicates in this field either none, one or two of these 3 bands supported.

For single band mobile station or a mobile station supporting none of the GSM 900 bands(P-GSM, E-GSM and R-GSM) and DCS 1800 bands, all bits are set to 0.

A5/4
Bit 1
0 Encryption algorithm A5/4 not available
1 Encryption algorithm A5/4 available

A5/5
Bit 1
0 Encryption algorithm A5/5 not available
1 Encryption algorithm A5/5 available

A5/6
Bit 1
0 Encryption algorithm A5/6 not available
1 Encryption algorithm A5/6 available

A5/7
0 Encryption algorithm A5/7 not available
1 Encryption algorithm A5/7 available

Associated Radio capability 1 and 2 (4 bit fields)

If either of P-GSM or E-GSM or R-GSM is supported, the radio capability 1 field indicates the radio capability for P-GSM, E-GSM or R-GSM, and the radio capability 2 field indicates the radio capability for DCS1800 if supported, and is spare otherwise.

If none of P-GSM or E-GSM or R-GSM are supported, the radio capability 1 field indicates the radio capability for DCS1800, and the radio capability 2 field is spare.

The radio capability contains the binary coding of the power class associated with the band indicated in multiband support bits (see 3GPP TS 45.005 [33]).

(continued...)

Table 10.5.1.7/3GPP TS 24.008 (continued): *MS Classmark 3* information element

R Support

In case where the R-GSM band is supported the R-GSM band associated radio capability field contains the binary coding of the power class associated (see GSM 45.005) (regardless of the number of GSM bands supported). A mobile station supporting the R-GSM band shall also when appropriate, (see 10.5.1.6) indicate its support in the 'FC' bit in the Mobile Station Classmark 2 information element.

Note: the coding of the power class for P-GSM, E-GSM, R-GSM and DCS 1800 in radio capability 1 and/or 2 is different to that used in the Mobile Station Classmark 1 and Mobile Station Classmark 2 information elements.

Multi Slot Class (5 bit field)

In case the MS supports the use of multiple timeslots then the Multi Slot Class field is coded as the binary representation of the multislot class defined in 3GPP TS 45.002 [32].

UCS2 treatment (1 bit field)

This information field indicates the likely treatment by the mobile station of UCS2 encoded character strings. If not included, the value 0 shall be assumed by the receiver.
Bit 1
0 the ME has a preference for the default alphabet (defined in 3GPP TS ~~03.38~~23.038 [8b]) over UCS2.
1 the ME has no preference between the use of the default alphabet and the use of UCS2.

Extended Measurement Capability (1 bit field)

This bit indicates whether the mobile station supports 'Extended Measurements' or not
Bit 1
0 the MS does not support Extended Measurements
1 the MS supports Extended Measurements

SMS_VALUE (Switch-Measure-Switch) (4 bit field)
The SMS field indicates the time needed for the mobile station to switch from one radio channel to another, perform a neighbour cell power measurement, and the switch from that radio channel to another radio channel.
Bits
4 3 2 1
0 0 0 0 1/4 timeslot (~144 microseconds)
0 0 0 1 2/4 timeslot (~288 microseconds)
0 0 1 0 3/4 timeslot (~433 microseconds)
. . .
1 1 1 1 16/4 timeslot (~2307 microseconds)

SM_VALUE (Switch-Measure) (4 bit field)
The SM field indicates the time needed for the mobile station to switch from one radio channel to another and perform a neighbour cell power measurement.
Bits
4 3 2 1
0 0 0 0 1/4 timeslot (~144 microseconds)
0 0 0 1 2/4 timeslot (~288 microseconds)
0 0 1 0 3/4 timeslot (~433 microseconds)
. . .
1 1 1 1 16/4 timeslot (~2307 microseconds)

MS Positioning Method Capability (1 bit field)
This bit indicates whether the MS supports Positioning Method or not for the provision of Location Services.

MS Positioning Method (5 bit field)
This field indicates the Positioning Method(s) supported by the mobile station.
MS assisted E-OTD
Bit 5
0 MS assisted E-OTD not supported
1 MS assisted E-OTD supported

Table 10.5.1.7/3GPP TS 24.008 (continued): *MS Classmark 3* information element

MS based E-OTD
Bit 4
0 MS based E-OTD not supported
1 MS based E-OTD supported

MS assisted GPS
Bit 3
0 MS assisted GPS not supported
1 MS assisted GPS supported

MS based GPS
Bit 2
0 MS based GPS not supported
1 MS based GPS supported

MS conventional GPS
Bit 1
0 conventional GPS not supported
1 conventional GPS supported

EDGE Multi Slot class (5 bit field)

In case the EDGE MS supports the use of multiple timeslots and the number of supported time slots is different from number of time slots supported for GMSK then the EDGE Multi Slot class field is included and is coded as the binary representation of the multislot class defined in 3GPP TS 45.002 [32].

Modulation Capability

Modulation Capability field indicates the supported modulation scheme by MS in addition to GMSK
Bit 1
0 8-PSK supported for downlink reception only
1 8-PSK supported for uplink transmission and downlink reception

EDGE RF Power Capability 1 (2 bit field)
If 8-PSK is supported for both uplink and downlink, the **EDGE RF Power Capability 1** field indicates the radio capability for 8-PSK modulation in GSM 400, GSM700, GSM850 or GSM900.

EDGE RF Power Capability 2 (2 bit field)
If 8-PSK modulation is supported for both uplink and downlink, the **EDGE RF Power Capability 2** field indicates the radio capability for 8-PSK modulation in DCS1800 or PCS1900 if supported, and is not included otherwise.

The respective **EDGE RF Power Capability 1** and **EDGE RF Power Capability 2** fields contain the following coding of the 8-PSK modulation power class (see 3GPP TS 45.005 [33]):
Bits 2 1
0 0 Reserved
0 1 Power class E1
1 0 Power class E2
1 1 Power class E3

Table 10.5.1.7/3GPP TS 24.008 (continued): *MS Classmark 3* information element

GSM 400 Bands Supported (2 bit field)
See the semantic rule for the sending of this field.
Bits
2 1
0 1 GSM 480 supported, GSM 450 not supported
1 0 GSM 450 supported, GSM 480 not supported
1 1 GSM 450 supported, GSM 480 supported

GSM 400 Associated Radio Capability (4 bit field)
If either GSM 450 or GSM 480 or both is supported, the GSM 400 Associated Radio Capability field indicates the radio capability for GSM 450 and/or GSM 480.

The radio capability contains the binary coding of the power class associated with the band indicated in GSM 400 Bands Supported bits (see 3GPP TS 45.005 [33]).

Note: the coding of the power class for GSM 450 and GSM 480 in GSM 400 Associated Radio Capability is different to that used in the Mobile Station Classmark 1 and Mobile Station Classmark 2 information elements.

GSM 850 Associated Radio Capability (4 bit field)
See the semantic rule for the sending of this field.
This field indicates whether GSM 850 band is supported and its associated radio capability.

The radio capability contains the binary coding of the power class associated with the GSM 850 band (see 3GPP TS 45.005 [33]).

Note: the coding of the power class for GSM 850 in GSM 850 Associated Radio Capability is different to that used in the Mobile Station Classmark 1 and Mobile Station Classmark 2 information elements.

PCS 1900 Associated Radio Capability (4 bit field)
See the semantic rule for the sending of this field.
This field indicates whether PCS 1900 band is supported and its associated radio capability.

The radio capability contains the binary coding of the power class associated with the PCS 1900 band (see 3GPP TS 45.005 [33]).

Note: the coding of the power class for PCS 1900 in PCS 1900 Associated Radio Capability is different to that used in the Mobile Station Classmark 1 and Mobile Station Classmark 2 information elements.

Table 10.5.1.7/3GPP TS 24.008 (continued): *MS Classmark 3* information element

UMTS FDD Radio Access Technology Capability (1 bit field)
Bit 1
0 UMTS FDD not supported
1 UMTS FDD supported

UMTS 3.84 Mcps TDD Radio Access Technology Capability (1 bit field)
Bit 1
0 UMTS 3.84 Mcps TDD not supported
1 UMTS 3.84 Mcps TDD supported

CDMA 2000 Radio Access Technology Capability (1 bit field)
Bit 1
0 CDMA2000 not supported
1 CDMA2000 supported

DTM GPRS Multi Slot Class (2 bit field)
This field indicates the GPRS DTM multislot capabilities of the MS. It is coded as follows:

Bit 2 1
0 0 Multislot class 1 supported
0 1 Multislot class 5 supported
1 0 Multislot class 9 supported
1 1 Reserved for future extension. If received, the network shall interpret this as '00'

MAC Mode Support (1 bit field)
This field indicates whether the MS supports Dynamic and Fixed Allocation or only supports Exclusive Allocation. It is coded as follows:

Bit 1
0 Dynamic and Fixed Allocation not supported
1 Dynamic and Fixed allocation supported

EGPRS DTM Multi Slot Class (2 bit field)
This field indicates the EGPRS DTM multislot capabilities of the MS. This field shall be included only if the mobile station supports EGPRS DTM. This field is coded as the DTM GPRS Multi Slot Class field.

Single Band Support
This field shall be sent if the mobile station supports UMTS and one and only one GSM band with the exception of R-GSM; this field shall not be sent otherwise

GSM Band (4 bit field)
Bits
4 3 2 1
0 0 0 0 E-GSM is supported
0 0 0 1 P-GSM is supported
0 0 1 0 DCS 1800 is supported
0 0 1 1 GSM 450 is supported
0 1 0 0 GSM 480 is supported
0 1 0 1 GSM 850 is supported
0 1 1 0 PCS 1900 is supported
0 1 1 1 GSM 700 is supported
All other values are reserved for future use.

NOTE: When this field is received, the associated RF power capability is found in Classmark 1 or 2.

GSM 700 Associated Radio Capability (4 bit field)

See the semantic rule for the sending of this field.
This field indicates whether GSM 700 band is supported and its associated radio capability.

The radio capability contains the binary coding of the power class associated with the GSM 700 band (see 3GPP TS 45.005 [33]).

Note: the coding of the power class for GSM 700 in GSM 700 Associated Radio Capability is different to that used in the Mobile Station Classmark 1 and Mobile Station Classmark 2 information elements.

UMTS 1.28 Mcps TDD Radio Access Technology Capability (1 bit field)

Bit 1
0 UMTS 1.28 Mcps TDD not supported
1 UMTS 1.28 Mcps TDD supported

GERAN Feature Package 1 (1 bit field)
This field indicates whether the MS supports the GERAN Feature Package 1 (see 3GPP TS 44.060). It is coded as follows:

Bit 1
0 GERAN feature package 1 not supported.
1 GERAN feature package 1 supported.

Extended GPRS DTM Multi Slot Class (2 bit field)
This field indicates the extended GPRS DTM multislot capabilities of the MS and shall be interpreted in conjunction with the GPRS DTM Multi Slot Class field. It is coded as follows, where 'DGMSC' denotes the DTM GPRS Multi Slot Class field:

DGMSC Bit	2 1	**Bit 2 1**	
	0 0	**0 0**	Multislot class 2 supported
	0 0	**0 1**	Multislot class 3 supported
	0 0	**1 0**	Multislot class 4 supported
	0 0	**1 1**	Multislot class 8 supported
	0 1	**0 0**	Multislot class 5 supported
	0 1	**0 1**	Multislot class 6 supported
	0 1	**1 0**	Multislot class 7 supported
	0 1	**1 1**	Spare. If received, the network shall interpret it as '(01) **00**'.
	1 0	**0 0**	Multislot class 9 supported
	1 0	**0 1**	Multislot class 10 supported
	1 0	**1 0**	Multislot class 11 supported
	1 0	**1 1**	Multislot class 12 supported

The presence of this field indicates that the MS supports combined fullrate and halfrate GPRS channels in the downlink.When this field is not present, the MS supports the multislot class indicated by the *DTM GPRS Multi Slot Class* field.

Extended DTM EGPRS Multi Slot Class (2 bit field)
This field is not considered when the EGPRS DTM Multi Slot Class field is not included. This field indicates the extended EGPRS DTM multislot capabilities of the MS and shall be interpreted in conjunction with the EGPRS DTM Multi Slot Class field. This field is coded as the Extended DTM GPRS Multi Slot Class field. The presence of this field indicates that the MS supports combined fullrate and halfrate GPRS channels in the downlink. When this field is not present, the MS supports the multislot class indicated by the *DTM GPRS Multi Slot Class* field.

10.5.3.5a Network Name

The purpose of this information element is to pass a text string to the mobile station.

The *Network Name* information element is coded as shown in figure 10.5.80/3GPP TS 24.008 and table 10.5.94/3GPP TS 24.008.

The *Network Name* is a type 4 information element with a minimum length of 3 octets. No upper length limit is specified except for that given by the maximum number of octets in a L3 message (see 3GPP TS 44.006 [19]).

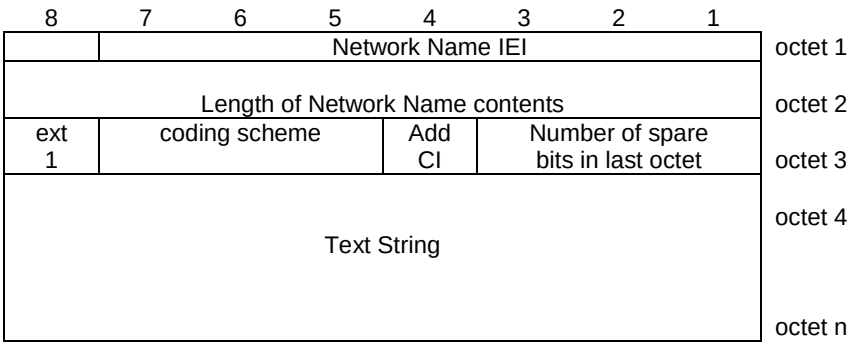

Figure 10.5.80/3GPP TS 24.008 *Network Name* information element

Table 10.5.94/3GPP TS 24.008 *Network Name* information element

Number of spare bits in last octet (octet 3, bits 1 to 3)

2	**1**		
0	0	1	bit 8 is spare and set to "0" in octet n
0	1	0	bits 7 and 8 are spare and set to "0" in octet n
0	1	1	bits 6 to 8(inclusive) are spare and set to "0" in octet n
1	0	0	bits 5 to 8(inclusive) are spare and set to "0" in octet n
1	0	1	bits 4 to 8(inclusive) are spare and set to "0" in octet n
1	1	0	bits 3 to 8(inclusive) are spare and set to "0" in octet n
1	1	1	bits 2 to 8(inclusive) are spare and set to "0" in octet n
0	0	0	this field carries no information about the number of spare bits in octet n

Add CI (octet 3, bit 4)

0	The MS should not add the letters for the Country's Initials to the text string
1	The MS should add the letters for the Country's Initials and a separator (e.g. a space) to the text string

Coding Scheme (octet 3, bits 5-7)

0	0	0	Cell Broadcast data coding scheme, GSM default alphabet, language unspecified, defined in 3GPP TS ~~03.38~~23.038 [8b]
0	0	1	UCS2 (16 bit) [72]
0	1	0	
to			reserved
1	1	1	

Text String (octet 4 to octet n, inclusive)
Encoded according to the Coding Scheme defined by octet 3, bits 5-7

10.5.4.5 Bearer capability

The purpose of the bearer capability information element is to describe a bearer service. The use of the bearer capability information element in relation to compatibility checking is described in annex B.

The bearer capability information element is coded as shown in figure 10.5.88/3GPP TS 24.008 and tables 10.5.102/3GPP TS 24.008 to 10.5.115/3GPP TS 24.008.

The bearer capability is a type 4 information element with a minimum length of 3 octets and a maximum length of 16 octets.

8	7	6	5	4	3	2	1	
	Bearer capability IEI							octet 1
	Length of the bearer capability contents							octet 2
0/1 ext	radio channel requirement		co-ding std	trans fer mode	information transfer capability			octet 3
0/1 ext	0 co-ding	CTM	0 spare	speech version indication				octet 3a*
0/1 ext	0 co-ding	0 spare	0 spare	speech version indication				octet 3b etc*
1 ext	comp -ress.	structure		dupl. mode	confi gur.	NIRR	esta-bli.	octet 4*
0/1 ext	0	0 access id.	rate adaption		signalling access protocol			octet 5*
0/1 ext	Other ITC		Other rate adaption		0	0 Spare	0	octet 5a*
1 ext	Hdr/ noHdr	Multi frame	Mode	LLI	Assig nor/e	Inb. neg	0 Spare	octet 5b*
0/1 ext	0	1 layer 1 id.	User information layer 1 protocol				sync/ async	octet 6*
0/1 ext	numb. stop bits	nego-tia-tion	numb. data bits	user rate				octet 6a*
0/1 ext	intermed. rate		NIC on TX	NIC on RX	Parity			octet 6b*
0/1 ext	connection element		modem type					octet 6c*
0/1 ext	Other modem type		Fixed network user rate					octet 6d*
0/1 ext	Acceptable channel codings				Maximum number of traffic channels			octet 6e*
0/1 ext	UIMI		Wanted air interface user rate					octet 6f*
1 ext	Acceptable channel codings extended			Asymmetry Indication		0 Spare	0	octet 6g*
1 ext	1	0 layer 2 id.	User information layer 2 protocol					octet 7*

Figure 10.5.88/3GPP TS 24.008 Bearer capability information element

NOTE 1: The coding of the octets of the bearer capability information element is not conforming to ITU Q.931.

NOTE 2: An MS shall encode the Bearer Capability infomation element according to GSM call control requirements also if it is requesting for a UMTS service.

NOTE 3: For UTRAN access the following parameter is irrelevant, because multiple traffic channels (multislot) are not deployed [3GPP TS 23.034]. The parameter shall, however, be stored in MSC, and forwarded at handover:
- UIMI, User initiated modification indication (octet 6f, bits 5-7)

NOTE 4: The following parameters are relevant in UMTS for non transparent data calls for deciding which RLP version to negotiate in order to avoid renegotiation of RLP version in case of inter-system handover, see 3GPP TS 24.022 [9]. They are otherwise irrelevant for specifying the UTRAN radio access bearer:
-

~~NOTE 5:~~ Maximum number of traffic channels (octet 6e, bits 1-3)
- Acceptable Channel coding(s) (octet 6e, bits 4, 5 and 7)
- Acceptable Channel Codings extended (octet 6g, bits 5-7).

NOTE 5~~6~~: A mobile station not supporting GSM shall set the following parameters to the value "0":
- Maximum number of traffic channels (octet 6e, bits 1-3)
- Acceptable Channel coding(s) (octet 6e, bits 4, 5 and 7)
- UIMI, User initiated modification indication (octet 6f, bits 5-7)
- Acceptable Channel Codings extended (octet 6g, bits 5-7).

10.5.4.15 Facility

The purpose of the facility information element is to transport supplementary service related information. Within the scope of 3GPP TS 24.008 the content of the Facility information field is an array of octets. The usage of this transportation mechanism is defined in 3GPP TS 24.080 [24].

The facility information element is coded as shown in figure 10.5.101/3GPP TS 24.008.

The facility is a type 4 information element with a minimum length of 2 octets. No upper length limit is specified except for that given by the maximum number of octets in a L3 message (see 3GPP TS 44.006 [19]).

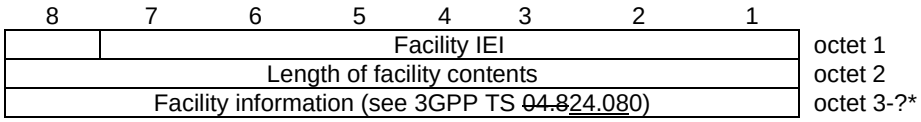

Figure 10.5.101/3GPP TS 24.008

10.5.4.24 SS Version Indicator

The purpose of the SS version indicator information element is to aid the decoding of the Facility information element as described in 3GPP TS 24.010. Within the scope of 3GPP TS 24.008 the contents of the SS Version information field is an array of one or more octets. The usage of the SS version information field is defined in 3GPP TS 24.080.

The SS version indicator information element is coded as shown in figure 10.5.113/3GPP TS 24.008.

The SS version indicator is a type 4 information element with a minimum length of 2 octets. No upper length limit is specified except for that given by the maximum number of octets in a L3 message (see 3GPP TS 44.006 [19]).

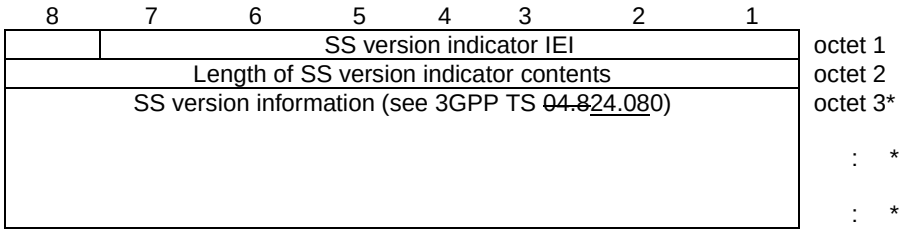

Figure 10.5.113/3GPP TS 24.008

NOTE: Usually, this information element has only one octet of content.

10.5.4.26 Alerting Pattern (NIA)

The purpose of the Alerting Pattern information element is to allow the network to convey information related to the alert to be used by the MS (see 3GPP TS 02.0722.101 [8]).

The Alerting Pattern information element is coded as shown in figure 10.5.115/3GPP TS 24.008 and table 10.5.132/3GPP TS 24.008.

The Alerting Pattern IE is a type 4 information element with 3 octet length.

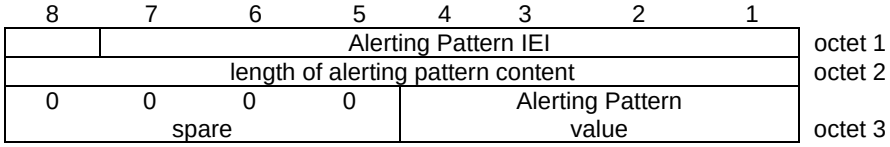

Figure 10.5.115/3GPP TS 24.008 Alerting Pattern information element

Table 10.5.132/3GPP TS 24.008: Alerting Pattern information element

Alerting Pattern value (octet 3) Bits **4 3 2 1**	
0 0 0 0	alerting pattern 1
0 0 0 1	alerting pattern 2
0 0 1 0	alerting pattern 3
0 1 0 0	alerting pattern 5
0 1 0 1	alerting pattern 6
0 1 1 0	alerting pattern 7
0 1 1 1	alerting pattern 8
1 0 0 0	alerting pattern 9
all other values are reserved	

Alerting pattern 1, 2 and 3 indicate alerting levels 0, 1 and 2.

Alerting pattern 5 to 9 indicate alerting categories 1 to 5

10.5.5.12 MS network capability

The purpose of the *MS network capability* information element is to provide the network with information concerning aspects of the mobile station related to GPRS. The contents might affect the manner in which the network handles the

operation of the mobile station. The *MS network capability* information indicates general mobile station characteristics and it shall therefore, except for fields explicitly indicated, be independent of the frequency band of the channel it is sent on.

The *MS network capability* is a type 4 information element with a maximum of 10 octets length.

The value part of a *MS network capability*information element is coded as shown in figure 10.5.128/3GPP TS 24.008 and table 10.5.145/3GPP TS 24.008.

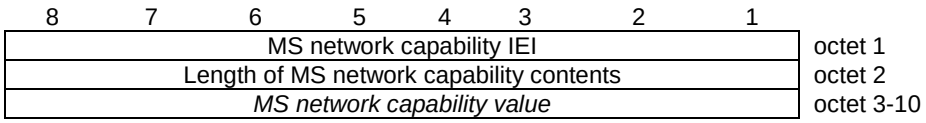

Figure 10.5.128/3GPP TS 24.008 MS network capability information element

Table 10.5.145/3GPP TS 24.008 *MS network capability* information element

<MS network capability value part> ::=

<**GEA1 bits**>
<**SM capabilities via dedicated channels**: bit>
<**SM capabilities via GPRS channels**: bit>
<**UCS2 support**: bit>
<**SS Screening Indicator**: bit string(2)>
<SoLSA Capability : bit>
<Revision level indicator: bit>
<PFC feature mode: bit>
<Extended GEA bits>
< LCS VA capability: bit >
<Spare bits>;

<**GEA1 bits**> ::= < **GEA/1** :bit>;

<Extended GEA bits> ::= <GEA/2:bit><GEA/3:bit>< GEA/4:bit >< GEA/5:bit >< GEA/6:bit ><GEA/7:bit>;

<**Spare bits**> ::= null | {<spare bit> < **Spare bits** >};

SS Screening Indicator
0 0 defined in 3GPP TS 24.080

0 1 defined in 3GPP TS 24.080
1 0 defined in 3GPP TS 24.080
1 1 defined in 3GPP TS 24.080

SM capabilities via dedicated channels
0 Mobile station does not support mobile terminated point to point SMS via dedicated signalling channels
1 Mobile station supports mobile terminated point to point SMS via dedicated signalling channels

SM capabilities via GPRS channels
0 Mobile station does not support mobile terminated point to point SMS via GPRS packet data channels
1 Mobile station supports mobile terminated point to point SMS via GPRS packet data channels

UCS2 support
This information field indicates the likely treatment by the mobile station of UCS2 encoded character strings.
0 the ME has a preference for the default alphabet (defined in 3GPP TS ~~03.38~~23.038 [8b]) over UCS2.
1 the ME has no preference between the use of the default alphabet and the use of UCS2.

GPRS Encryption Algorithm GEA/1
0 encryption algorithm **GEA/1**not available
1 encryption algorithm **GEA/1** available

SoLSA Capability
0 The ME does not support SoLSA.
1 The ME supports SoLSA.

Revision level indicator
0 used by a mobile station not supporting R99 or later versions of the protocol
1 used by a mobile station supporting R99 or later versions of the protocol

PFC feature mode
0 Mobile station does not support BSS packet flow procedures
1 Mobile station does support BSS packet flow procedures

GEA/2
0 encryption algorithm GEA/2 not available
1 encryption algorithm GEA/2 available

GEA/3
0 encryption algorithm GEA/3 not available
1 encryption algorithm GEA/3 available

GEA/4
0 encryption algorithm GEA/4 not available
1 encryption algorithm GEA/4 available

GEA/5
0 encryption algorithm GEA/5 not available
1 encryption algorithm GEA/5 available

GEA/6
0 encryption algorithm GEA/6 not available
1 encryption algorithm GEA/6 available

GEA/7
0 encryption algorithm GEA/7 not available
1 encryption algorithm GEA/7 available

LCS VA capability (LCS value added location request notification capability)
0 LCS value added location request notification capability not supported
1 LCS value added location request notification capability supported

10.5.5.12a MS Radio Access capability

The purpose of the *MS RA capability* information element is to provide the radio part of the network with information concerning radio aspects of the mobile station. The contents might affect the manner in which the network handles the operation of the mobile station.

The *MS RA capability* is a type 4 information element, with a maximum length of 52 octets.

The value part of a *MS RA capability* information element is coded a shown table 10.5.146/3GPP TS 24.008.

For the indication of the Access Technology Types the following conditions shall apply:

- Among the three Access Type Technologies GSM 900-P, GSM 900-E and GSM 900-R only one shall be present.
- Due to shared radio frequency channel numbers between GSM 1800 and GSM 1900, the mobile station should provide the relevant radio access capability for either GSM 1800 band OR GSM 1900 band, not both.
- The MS shall indicate its supported Access Technology Types during a single MM procedure.
- If the alternative coding by using the Additional access technologies struct is chosen by the mobile station, the mobile station shall indicate its radio access capability for the serving BCCH frequency band in the first included Access capabilities struct.
- The first Access Technology Type shall not be set to "1111".

For error handling the following shall apply:

– If a received Access Technology Type is unknown to the receiver, it shall ignore all the corresponding fields.

– If within a known Access Technology Type a receiver recognizes an unknown field it shall ignore it.

– For more details about error handling of MS radio access capability see 3GPP TS 48.018 [86].

Table 10.5.146/3GPP TS 24.008: *Mobile Station Radio Access Capability* Information Element

< MS Radio Access capability IE > ::=
<**MS Radio Access capability IEI** : 00100100 >
<**Length of MS RA capability**: <octet>> -- *length in octets of MS RA capability value part and spare bits*
<**MS RA capability value part** : < MS RA capability value part struct >>
<spare bits>**; -- *may be used for future enhancements*

<MS RA capability value part struct >::= --*recursive structure allows any number of Access technologies*
{ { < **Access Technology Type**: bit (4) exclude 1111 >
< **Access capabilities** : <Access capabilities struct> > }

| { < **Access Technology Type**: bit (4) == 1111 > -- *structure adding Access technologies with same capabilities*
< **Length** : bit (7) > -- *length in bits of list of Additional access technologies and spare bits*
{ 1 < **Additional access technologies**: < Additional access technologies struct > > } ** 0
<spare bits>** } }

{ 0 | 1 <MS RA capability value part struct> } ;

< Additional access technologies struct > ::=
< **Access Technology Type** : bit (4) >
< **GMSK Power Class** : bit (3) >
< **8PSK Power Class** : bit (2) > ;

< Access capabilities struct > ::=
< **Length** : bit (7) > -- length in bits of Content and spare bits
<Access capabilities : <Content>>
<spare bits>** ; -- expands to the indicated length
-- may be used for future enhancements

< Content > ::=
< **RF Power Capability** : bit (3) >
{ 0 | 1 <**A5 bits** : <A5 bits> > } -- *zero means that the same values apply for parameters as in the immediately preceding Access capabilities field within this IE*
< **ES IND** : bit >
< **PS** : bit >
< **VGCS** : bit >
< **VBS** : bit >
{ 0 | 1 < **Multislot capability** : Multislot capability struct > } -- *zero means that the same values for multislot parameters as given in an earlier Access capabilities field within this IE apply also here*
-- Additions in release 99
{ 0 | 1 < **8PSK Power Capability** : bit(2) >} -- *'1' also means 8PSK modulation capability in uplink.*
< **COMPACT Interference Measurement Capability : bit >**
< **Revision Level Indicator** : bit >
< **UMTS FDD Radio Access Technology Capability** : bit > -- *3G RAT*
< **UMTS 3.84 Mcps TDD Radio Access Technology Capability** : bit > -- *3G RAT*
< **CDMA 2000 Radio Access Technology Capability** : bit > -- *3G RAT*
-- Additions in release 4
< **UMTS 1.28 Mcps TDD Radio Access Technology Capability**: bit > -- *3G RAT*
< GERAN Feature Package 1 : bit >
{ 0 | 1 < **Extended DTM GPRS Multi Slot Class** : bit(2) >
< **Extended DTM EGPRS Multi Slot Class** : bit(2) > };
-- error: struct too short, assume features do not exist
-- error: struct too long, ignore data and jump to next Access technology

Table 10.5.146/3GPP TS 24.008 (continued): *Mobile Station Radio Access Capability* IE

< Multislot capability struct > ::=
{ 0 | 1 < **HSCSD multislot class** : bit (5) > }
{ 0 | 1 < **GPRS multislot class** : bit (5) > < **GPRS Extended Dynamic Allocation Capability** : bit > }
{ 0 | 1 < **SMS_VALUE** : bit (4) > < **SM_VALUE** : bit (4) > }
-- *Additions in release 99*
{ 0 | 1 < **ECSD multislot class** : bit (5) > }
{ 0 | 1 < **EGPRS multislot class** : bit (5) > < **EGPRS Extended Dynamic Allocation Capability** : bit > }
{0 | 1 < **DTM GPRS Multi Slot Class**: bit(2)>
<MAC Mode Support : bit>
{0 | 1 <**EGPRS DTM Multi Slot Class** : bit(2)> } } ;
-- error: struct too short, assume features do not exist

<A5 bits> ::= < A5/1 : bit> <A5/2 : bit> <A5/3 : bit> <A5/4 : bit> <A5/5 : bit> <A5/6 : bit> <A5/7 : bit>; -- bits for circuit mode ciphering algorithms. These fields are not used by the network and may be excluded by the MS.

Access Technology Type
This field indicates the access technology type to be associated with the following access capabilities.
Bits
4 3 2 1
0 0 0 0 GSM P
0 0 0 1 GSM E *--note that GSM E covers GSM P*
0 0 1 0 GSM R *--note that GSM R covers GSM E and GSM P*
0 0 1 1 GSM 1800
0 1 0 0 GSM 1900
0 1 0 1 GSM 450
0 1 1 0 GSM 480
0 1 1 1 GSM 850
1 0 0 0 GSM 700
1 1 1 1 Indicates the presence of a list of Additional access technologies
All other values are treated as unknown by the receiver.

RF Power Capability, GMSK Power Class (3 bit field)
This field contains the binary coding of the power class used for GMSK associated with the indicated Access Technology Type (see 3GPP TS 45.005).

8PSK Power Capability (2 bit field)
If 8-PSK modulation is supported for uplink, this field indicates the radio capability for 8-PSK modulation. The following coding is used (see 3GPP TS 45.005 [33]):
Bits 2 1
0 0 Reserved
0 1 Power class E1
1 0 Power class E2
1 1 Power class E3

8PSK Power Class (2 bit field)
This field indicates the radio capability for 8-PSK modulation. The following coding is used (see 3GPP TS 45.005~~05.05~~):
Bits 2 1
0 0 8PSK modulation not supported for uplink
0 1 Power class E1
1 0 Power class E2
1 1 Power class E3

Additional access technologies struct
This structure contains the GMSK Power Class and 8PSK Power Class for an additional Access Technology. All other capabilities for this indicated Access Technology are the same as the capabilities indicated by the preceding Access capabilities struct.

A5/1
0 encryption algorithm A5/1 not available
1 encryption algorithm A5/1 available
A5/2
0 encryption algorithm A5/2 not available
1 encryption algorithm A5/2 available
A5/3

0 encryption algorithm A5/3 not available
1 encryption algorithm A5/3 available

A5/4

0 encryption algorithm A5/4 not available
1 encryption algorithm A5/4 available

A5/5

0 encryption algorithm A5/5 not available
1 encryption algorithm A5/5 available

A5/6

0 encryption algorithm A5/6 not available
1 encryption algorithm A5/6 available

A5/7

0 encryption algorithm A5/7 not available
1 encryption algorithm A5/7 available

ES IND – (Controlled early Classmark Sending)

0 "controlled early Classmark Sending" option is not implemented
1 "controlled early Classmark Sending" option is implemented

Table 10.5.146/3GPP TS 24.008 (concluded): *Mobile Station Radio Access Capability* Information Element

PS – (Pseudo Synchronisation)
0 PS capability not present
1 PS capability present

VGCS – (Voice Group Call Service)
0 no VGCS capability or no notifications wanted
1 VGCS capability and notifications wanted.

VBS – (Voice Broadcast Service)
0 no VBS capability or no notifications wanted
1 VBS capability and notifications wanted

HSCSD Multi Slot Class
The Multi Slot Class field is coded as the binary representation of the multislot class defined in 3GPP TS 45.002 [32]. This field is not used by the network and may be excluded by the MS.
Range 1 to 18, all other values are reserved.

GPRS Multi Slot Class
The GPRS Multi Slot Class field is coded as the binary representation of the multislot class defined in 3GPP TS 45.002 [32].

-- *Additions in release 99*

ECSD Multi Slot Class
The presence of this field indicates ECSD capability. Whether the MS is capable of 8-PSK modulation in uplink is indicated by the presence of 8-PSK Power Capability field. The Multi Slot Class field is coded as the binary representation of the multislot class defined in 3GPP TS 45.002 [32]. This field is not used by the network and may be excluded by the MS.
Range 1 to 18, all other values are reserved.

EGPRS Multi Slot Class
The presence of this field indicates EGPRS capability. Whether the MS is capable of 8-PSK modulation in uplink is indicated by the presence of 8-PSK Power Capability field. The EGPRS Multi Slot Class field is coded as the binary representation of the multislot class defined in 3GPP TS 45.002 [32].

GPRS Extended Dynamic Allocation Capability
0 Extended Dynamic Allocation Capability for GPRS is not implemented
1 Extended Dynamic Allocation Capability for GPRS is implemented
EGPRS Extended Dynamic Allocation Capability
0 Extended Dynamic Allocation Capability for EGPRS is not implemented
1 Extended Dynamic Allocation Capability for EGPRS is implemented

SMS_VALUE (Switch-Measure-Switch) (4 bit field)
The SMS field indicates the time needed for the mobile station to switch from one radio channel to another, perform a neighbor cell power measurement, and the switch from that radio channel to another radio channel. This field is not used by the network and may be excluded by the MS.
Bits
4 3 2 1
0 0 0 0 1/4 timeslot (~144 microseconds)
0 0 0 1 2/4 timeslot (~288 microseconds)
0 0 1 0 3/4 timeslot (~433 microseconds)
. . .
1 1 1 1 16/4 timeslot (~2307 microseconds)
(SM_VALUE) Switch-Measure (4 bit field)
The SM field indicates the time needed for the mobile station to switch from one radio channel to another and perform a neighbour cell power measurement. This field is not used by the network and may be excluded by the MS.
Bits
4 3 2 1
0 0 0 0 1/4 timeslot (~144 microseconds)
0 0 0 1 2/4 timeslot (~288 microseconds)
0 0 1 0 3/4 timeslot (~433 microseconds)
. . .
1 1 1 1 16/4 timeslot (~2307 microseconds)

DTM GPRS Multi Slot Class (2 bit field**)**
This field indicates the GPRS DTM multislot capabilities of the MS. It is coded as follows:
Bits
2 1
0 0 Multislot class 1 supported
0 1 Multislot class 5 supported
1 0 Multislot class 9 supported
1 1 Reserved for future extension. If received, the network shall interpret this as '00'

MAC Mode Support (1 bit field)
This field indicates whether the MS supports Dynamic and Fixed Allocation or only supports Exclusive Allocation
Bit
1
0 Dynamic and Fixed Allocation not supported
1 Dynamic and Fixed allocation supported

EGPRS DTM Multi Slot Class (2 bit field)
This field indicates the EGPRS DTM multislot capabilities of the MS. This field shall be included only if the mobile station supports EGPRS DTM. This field is coded as the DTM GPRS multislot Class field.

COMPACT Interference Measurement Capability (1 bit field)
Bit
0 COMPACT Interference Measurement Capability is not implemented
1 COMPACT Interference Measurement Capability is implemented

Revision Level Indicator (1 bit field)
Bit
0 The ME is Release '98 or older
1 The ME is Release '99 onwards

UMTS FDD Radio Access Technology Capability (1 bit field)
Bit
0 UMTS FDD not supported
1 UMTS FDD supported

UMTS 3.84 Mcps TDD Radio Access Technology Capability (1 bit field)
Bit
0 UMTS 3.84 Mcps TDD not supported
1 UMTS 3.84 Mcps TDD supported

CDMA 2000 Radio Access Technology Capability (1 bit field)
Bit
0 CDMA2000 not supported
1 CDMA2000 supported

UMTS 1.28 Mcps TDD Radio Access Technology Capability (1 bit field)
Bit
0 UMTS 1.28 Mcps TDD not supported
1 UMTS 1.28 Mcps TDD supported

GERAN Feature Package 1 (1 bit field)
This field indicates whether the MS supports the GERAN Feature Package 1 (see 3GPP TS 44.060). It is coded as follows:
Bit
0 GERAN feature package 1 not supported.
1 GERAN feature package 1 supported.

Extended GPRS DTM Multi Slot Class (2 bit field)
This field indicates the extended GPRS DTM capabilities of the MS and shall be interpreted in conjunction with the GPRS DTM Multi Slot Class field. It is coded as follows, where 'DGMSC' denotes the DTM GPRS multislot class field:

DGMSC Bit	2 1	**Bit 2 1**	
	0 0	**0 0**	Multislot class 2 supported
	0 0	**0 1**	Multislot class 3 supported
	0 0	**1 0**	Multislot class 4 supported

0 0	**1 1**	Multislot class 8 supported
0 1	**0 0**	Multislot class 5 supported
0 1	**0 1**	Multislot class 6 supported
0 1	**1 0**	Multislot class 7 supported
0 1	**1 1**	Spare. If received, the network shall interpret it as '01 **00**'.
1 0	**0 0**	Multislot class 9 supported
1 0	**0 1**	Multislot class 10 supported
1 0	**1 0**	Multislot class 11 supported
1 0	**1 1**	Multislot class 12 supported

The presence of this field indicates that the MS supports combined fullrate and halfrate GPRS channels in the downlink. When this field is not present, the MS supports the multislot class indicated by the *DTM GPRS Multi Slot Class* field.

Extended EGPRS DTM Multislot Class (2 bit field)
This field is not considered when the EGPRS DTM Multislot Class field is not included. This field indicates the extended EGPRS DTM multislot capabilities of the MS and shall be interpreted in conjunction with the EGPRS DTM Multislot Class field. This field is coded as the Extended DTM GPRS Multislot Class field. The presence of this field indicates that the MS supports combined fullrate and halfrate GPRS channels in the downlink. When this field is not present, the MS supports the multislot class indicated by the *DTM GPRS Multi Slot Class* field.

11.3 Timers of circuit-switched call control

Table 11.3/3GPP TS 24.008: Call control timers - MS side

TIM NUM.	TIM VAL	STATE OF CALL	CAUSE OF START	NORMAL STOP	AT FIRST EXPIRY	AT SECOND EXPIRY
T303	30s	Call initiated	CM SER RQ sent	CALL PROC, or REL COMP received	Clear the call	Timer is not restarted
T305	30s	Disconnect Request	DISC sent	REL or DISC received	REL sent.	Timer is not restarted
T308	30s	Release request	REL sent	REL COMP or REL received	Retrans. RELEASE restart T308	Call ref. release
T310 Note 1	30s	Outgoing call Proceeding	CALL PROC received	ALERT,CONN, DISC or PROG rec.	Send DISC	Timer is not restarted
T313	30s	Connect Request	CONN sent	CONNect ACKnowledge received	Send DISC	Timer is not restarted
T323	30s	Modify Request	MOD sent	MOD COMP or MOD REJ received	Clear the call	Timer is not restarted
T332	30s	Wait for network info	START_CC sent	CC-EST. received	Clear the call	Timer is not restarted
T335	30s	CC-Est. Confirmed	CC-EST CONF.sent	RECALL received	Clear the call	Timer is not restarted
T336	10s		START DTMF sent	START DTMF ACK or START DTMF REJECT received	The MS considers the DTMF Procedure (for the digit) to be terminated	Timer is not restarted
T337	10s		STOP DTMF sent	STOP DTMF ACK received	The MS considers the DTMF procedure (for the current digit) to be terminated	Timer is not restarted

NOTE 1: T310 is not started if progress indicator #1, #2, or #64 has been delivered in the CALL PROCEEDING message or in a previous PROGRESS message.

Table 11.4/3GPP TS 24.008: Call control timers - network side

TIM NUM.	DFT TIM VAL	STATE OF CALL	CAUSE FOR START	NORMAL STOP	AT FIRST EXPIRY	AT SECOND EXPIRY
T301 Note 1	Min180s	Call received	ALERT received	CONN received	Clear the call	Timer is not restarted
T303	Note 2	Call present	SETUP sent	CALL CONF or REL COMP received	Clear the call	Timer is not restarted
T305	30s	Disconnect Indication	DISC without progress indic. #8 sent or CCBS Possible	REL or DISC received	Network sends RELEASE	Timer is not restarted
T306	30s	Disconnect Indication	DISC with progress indic. #8 sent but no CCBS possible	REL or DISC received	Stop the tone/ announc. Send REL	Timer is not restarted
T308	Note 2	Release request	REL sent	REL COMP or REL received	Retrans. RELEASE restart T308	Release call reference
T310	Note 2	Incoming call proceeding	CALL CONF received	ALERT, CONN or DISC received	Clear the call	Timer is not restarted
T313	Note 2	Connect Indication	CON sent	CON ACK received	Clear the call	Timer is not restarted
T323	30s	Modify request	MOD sent	MOD COMP or MOD REJ received	Clear the call	Timer is not restarted
T331	Note 2	CC Connec. Pending	CM-SERV PROMPT sent	START CC received	Clear the call	Timer is not restarted
T333	Note 2	CC-Est. Present	START CC received	CC-EST.CONF or REL COMP received	Clear the call	Timer is not restarted
T334 Note 3	Min 15s	CC-Est. Confirmed	RECALL sent	SETUP received	Clear the call	Timer is not restarted
T338	Note 2	Disconnect indication	DISC with CCBS possible	REL or DISC received	stop any tone/ announc. Send REL	Timer is not restarted

NOTE 1: The network may already have applied an internal alerting supervision function; e.g. incorporated within call control. If such a function is known to be operating on the call, then timer T301 is not used.

NOTE 2: These time values are set by the network operator.

NOTE 3: When applied to the supplementary service CCBS, the timer T334 can either represent the recall timer T4 or the notification timer T10 (see 3GPP TS 23.093~~03.93~~). Thus the timer T334 can take two different values. 3GPP TS 23.093~~03.93~~ defines the range of these values.

C.2 Principles

C.2.1 Definition of types of information

There are three different types of information that the calling PLMN user may specify during call setup to identify low layer capabilities needed in the network and in the destination terminal:

a) type I information is information about the calling terminal which is only used at the destination end to allow a decision regarding terminal compatibility. An example would be the user information layer 3 protocol. Type I information is encoded in octets 5 to 7 of the low layer compatibility information element;

b) type II information is only used by the network (PLMN) to which the calling user is connected for selection of PLMN specific network resources, e.g. channel type or specific functionality within the interworking function (IWF, see 3GPP TS 29.007~~09.07~~). This type of information is always present. An example is the connection element. Type II information is coded in:

   i) octet 3 of the bearer capability information element when the information transfer capability required by the calling user is speech ;

   ii) octets 3, 4, 5, and optionally octet 7 of the bearer capability information element when the information transfer capability required by the calling user is not speech;

c) type III information is required for selection of a basic service from the choice of basic services offered by the network and together with type II information for selection of an appropriate interworking function (IWF, see 3GPP TS 29.007 [38]), as well as for terminal compatibility checking at the destination terminal. An example is the information transfer capability. Type III information is always present and is encoded in:

   i) octet 3 of the bearer capability information element when the information transfer capability required by the calling user is speech ;

   ii) octets 3, 5, 6, 6a, 6b and 6c of the bearer capability information element when the information transfer capability required by the calling user is not speech;

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Bangkok, Thailand, 11 – 15 November 2002 **Rev. of N1-022323**

CR-Form-v7

CHANGE REQUEST

⌘ **24.008** **CR** **721** ⌘ **rev** **1** ⌘ Current version: **5.5.0** ⌘

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

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

Title:	⌘	Correcting errors and making improvements to references
Source:	⌘	CN1 secretary
Work item code:	⌘	TEI4
Date:	⌘	13/11/2002
Category:	⌘	**A**
Release:	⌘	Rel-5

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

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
Rel-4 (Release 4)
Rel-5 (Release 5)
Rel-6 (Release 6)

Reason for change:	⌘	Misleading references and missing or non-existing references are corrected.
Summary of change:	⌘	02.07 was split into 22.001 and 22.101. It was not referenced and this version only needs to refer 22.101. 02.40 was not continued after R98 but moved to 22.001. 24.071 and 24.108 is referenced but never existed, => 44.071 and 24.008. 04.64 has [76] as reference which is wrong, but 44.064 is introduced with [78a]. 03.01, 03.38, 03.93 becomes respectively 23.101, 23.038 and 23.093. The following were introduced in chapter 2 since they are refered to in the specification: 22.101, 23.038, 23.093, 23.108, 25.321, 25.322, 25.413, 33.102 and 44.064. Some editorials do the final cleanup. Revised due to deleting ref.[9] (3GPP TS 03.01) in 5.2.1.10 since the feature is not carried on to 23.101. In 4.5.1.5 the last line that was deleted text is now merged to the NOTE, and in 10.5.4.5 the Note 4 and Note 5 is merged making Note 6 become Note 5.
Consequences if not approved:	⌘	Wrong guidance given and so confusing the readers.

Clauses affected:	⌘	1.1, 2, 4.5.1.5, 4.5.1.6.1, 4.7.1.7, 4.7.5.2.3, 4.7.6.3, 4.7.7.2, 4.7.7.3, 4.7.7.8, 5.2.1.10, 5.2.2.3.3, 6.1.2, 7, 8.1, 8.8, 9.3.23, 10.1, 10.5.1.6, 10.5.1.7, 10.5.3.5a, 10.5.4.15, 10.5.4.24, 10.5.4.26, 10.5.5.12, 10.5.5.12a, 11.3, Annex C.2.1

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

Other comments: ⌘

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

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

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

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

1.1 Scope of the Technical Specification

The procedures currently described in this TS are for the call control of circuit-switched connections, session management for GPRS services, mobility management and radio resource management for circuit-switched and GPRS services.

3GPP TS 24.010 contains functional procedures for support of supplementary services.

3GPP TS 24.011 contains functional procedures for support of point-to-point short message services.

3GPP TS 24.012 contains functional description of short message - cell broadcast.

3GPP TS 44.060 [76] contains procedures for radio link control and medium access control (RLC/MAC) of packet data physical channels.

3GPP TS 44.071 [23a]~~24.071~~ contains functional descriptions and procedures for support of location services.

NOTE: "layer 3" includes the functions and protocols described in the present document. The terms "data link layer" and "layer 2" are used interchangeably to refer to the layer immediately below layer 3.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] Void.

[2] Void.

[2a] 3GPP TR 21.905 "Vocabulary for 3GPP Specifications"

[3] 3GPP TS 22.002: "Circuit Bearer Services (BS) supported by a Public Land Mobile Network (PLMN)".

[4] 3GPP TS 22.003: "Teleservices supported by a Public Land Mobile Network (PLMN)".

[5] 3GPP TS 42.009: "~~Digital cellular telecommunications system (Phase 2+);~~ Security aspects".

[5a] 3GPP TS 33.102: "3G security; Security architecture".

[6] 3GPP TS 22.011: "~~Digital cellular telecommunications system (Phase 2+);~~ Service accessibility".

[7] 3GPP TS 42.017: "~~Digital cellular telecommunications system (Phase 2+);~~ Subscriber Identity Modules (SIM); Functional characteristics".

[8] 3GPP TS 22.101: "Service aspects; Service principles"~~3GPP TS 02.40: "Digital cellular telecommunications system (Phase 2+); Procedures for call progress indications"~~.

[8a] 3GPP TS 22.001: "Principles of circuit telecommunication services supported by a Public Land Mobile Network (PLMN)".

[8b] 3GPP TS 23.038: "Alphabets and language-specific information".

[9] 3GPP TS 23.101: "General UMTS Architecture".~~3GPP TS 03.01: "Digital cellular telecommunications system (Phase 2+); Network functions".~~

[9a] 3GPP TS 23.108: "Mobile radio interface layer 3 specification core network protocols; Stage 2 (structured procedures)".

[10] 3GPP TS 23.003: "~~Digital cellular telecommunications system (Phase 2+);~~ Numbering, addressing and identification".

[11] 3GPP TS 43.013: "~~Digital cellular telecommunications system (Phase 2+);~~ Discontinuous Reception (DRX) in the GSM system".

[12] 3GPP TS 23.014: "~~Digital cellular telecommunications system (Phase 2+);~~ Support of Dual Tone Multi-Frequency (DTMF) signalling".

[12a] Void.

[13] 3GPP TS 43.020: "~~Digital cellular telecommunications system (Phase 2+);~~ Security-related network functions".

[14] 3GPP TS 23.122: "Non-Access-Stratum functions related to Mobile Station (MS) in idle mode".

[15] 3GPP TS 24.002: "GSM-UMTS Public Land Mobile Network (PLMN) access reference configuration".

[16] 3GPP TS 44.003: "~~Digital cellular telecommunications system (Phase 2+);~~ Mobile Station - Base Station System (MS - BSS) interface; Channel structures and access capabilities".

[17] 3GPP TS 44.004: "~~Digital cellular telecommunications system (Phase 2+);~~ Layer 1; General requirements".

[18] 3GPP TS 44.005: "~~Digital cellular telecommunications system (Phase 2+);~~ Data Link (DL) layer; General aspects".

[19] 3GPP TS 44.006: "~~Digital cellular telecommunications system (Phase 2+);~~ Mobile Station - Base Station System (MS - BSS) interface; Data Link (DL) layer specification".

[19a] 3GPP TS 25.321: "Medium Access Control (MAC) protocol specification".

[19b] 3GPP TS 25.322: "Radio Link Control (RLC) protocol specification".

[19c] 3GPP TS 25.413: "UTRAN Iu interface RANAP signalling".

[20] 3GPP TS 24.007: "~~Digital cellular telecommunications system (Phase 2+);~~ Mobile radio interface signalling layer 3; General aspects".

[21] 3GPP TS 24.010: "~~Digital cellular telecommunications system ;~~ Mobile radio interface layer 3; Supplementary services specification; General aspects".

[22] 3GPP TS 24.011: "Point-to-Point (PP) Short Message Service (SMS) support on mobile radio interface".

[23] 3GPP TS 24.012: "Short Message Service Cell Broadcast (SMSCB) support on the mobile radio interface".

[23a] 3GPP TS 44.071~~24.071~~: "Location Services (LCS); Mobile radio interface layer 3 specification~~Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 location services specification~~."

[23b] 3GPP TS 44.031 "~~Digital cellular telecommunication system (Phase 2+);~~ Location Services LCS); Mobile Station (MS) - Serving Mobile Location Centre (SMLC); Radio Resource LCS Protocol (RRLP)".

[23c] 3GPP TS 25.331: "~~3rd Generation Partnership Project;Technical Specification Group Radio Access Network;~~ Radio Resource Control (RRC) protocol specification"

[24] 3GPP TS 24.080: "~~Digital cellular telecommunications system (Phase 2+);~~ Mobile radio Layer 3 supplementary service specification; Formats and coding".

[25] 3GPP TS 24.081: "~~Digital cellular telecommunications system (Phase 2+);~~ Line identification supplementary services; Stage 3".

[26] 3GPP TS 24.082: "~~Digital cellular telecommunications system (Phase 2+);~~ Call Forwarding (CF) supplementary services; Stage 3".

[27] 3GPP TS 24.083: "~~Digital cellular telecommunications system (Phase 2+);~~ Call Waiting (CW) and Call Hold (HOLD) supplementary services; Stage 3".

[28] 3GPP TS 24.084: "~~Digital cellular telecommunications system (Phase 2+);~~ MultiParty (MPTY) supplementary services; Stage 3".

[29] 3GPP TS 24.085: "~~Digital cellular telecommunications system (Phase 2+);~~ Closed User Group (CUG) supplementary services; Stage 3".

[30] 3GPP TS 24.086: "~~Digital cellular telecommunications system (Phase 2+);~~ Advice of Charge (AoC) supplementary services; Stage 3".

[31] 3GPP TS 24.088: "Call Barring (CB) supplementary services; Stage 3".

[32] 3GPP TS 45.002: "~~Digital cellular telecommunications system (Phase 2+);~~ Multiplexing and multiple access on the radio path".

[33] 3GPP TS 45.005: "~~Digital cellular telecommunications system (Phase 2+);~~ Radio transmission and reception".

[34] 3GPP TS 45.008: "~~Digital cellular telecommunications system (Phase 2+);~~ Radio subsystem link control".

[35] 3GPP TS 45.010: "~~Digital cellular telecommunications system (Phase 2+);~~ Radio subsystem synchronization".

[36] 3GPP TS 27.001: "General on Terminal Adaptation Functions (TAF) for Mobile Stations (MS)".

[36a] 3GPP TS 27.060: "Mobile Station (MS) supporting Packet Switched Services ".

[37] 3GPP TS 29.002: "~~Digital cellular telecommunications system (Phase 2+);~~ Mobile Application Part (MAP) specification".

[38] 3GPP TS 29.007: "~~Digital cellular telecommunications system (Phase 2+);~~ General requirements on interworking between the Public Land Mobile Network (PLMN) and the Integrated Services Digital Network (ISDN) or Public Switched Telephone Network (PSTN)".

[39] 3GPP TS 51.010: "~~Digital cellular telecommunications system (Phase 2+);~~ Mobile Station (MS) conformance specification".

[40] 3GPP TS 51.021: "~~Digital cellular telecommunications system (Phase 2);~~ GSM radio aspects base station system equipment specification".

[41] ISO/IEC 646 (1991): "Information technology - ISO 7-bit coded character set for information interchange".

[42] ISO/IEC 6429: "Information technology - Control functions for coded character sets".

[43] ISO 8348 (1987): "Information technology -- Open Systems Interconnection -- Network Service Definition".

[44] ITU-T Recommendation E.163: "Numbering plan for the international telephone service".

[45] ITU-T Recommendation E.164: "The international public telecommunication numbering plan".

[46] ITU-T Recommendation E.212: "The international identification plan for mobile terminals and mobile users".

[47] ITU-T Recommendation F.69 (1993): "The international telex service - Service and operational provisions of telex destination codes and telex network identification codes".

[48] ITU-T Recommendation I.330: "ISDN numbering and addressing principles".

[49] ITU-T Recommendation I.440 (1989): "ISDN user-network interface data link layer - General aspects".

[50] ITU-T Recommendation I.450 (1989): "ISDN user-network interface layer 3 General aspects".

[51] ITU-T Recommendation I.500 (1993): "General structure of the ISDN interworking recommendations".

[52] ITU-T Recommendation T.50: "International Reference Alphabet (IRA) (Formerly International Alphabet No. 5 or IA5) - Information technology - 7-bit coded character set for information interchange~~International Alphabet No. 5~~".

[53] ITU Recommendation Q.931: ISDN user-network interface layer 3 specification for basic control".

[54] ITU-T Recommendation V.21: "300 bits per second duplex modem standardized for use in the general switched telephone network".

[55] ITU-T Recommendation V.22: "1200 bits per second duplex modem standardized for use in the general switched telephone network and on point-to-point 2-wire leased telephone-type circuits".

[56] ITU-T Recommendation V.22bis: "2400 bits per second duplex modem using the frequency division technique standardized for use on the general switched telephone network and on point-to-point 2-wire leased telephone-type circuits".

[57] Void.

[58] ITU-T Recommendation V.26ter: "2400 bits per second duplex modem using the echo cancellation technique standardized for use on the general switched telephone network and on point-to-point 2-wire leased telephone-type circuits".

[59] ITU-T Recommendation V.32: "A family of 2-wire, duplex modems operating at data signalling rates of up to 9600 bit/s for use on the general switched telephone network and on leased telephone-type circuits".

[60] ITU-T Recommendation V.110: "Support by an ISDN of data terminal equipments with V-Series type interfaces".

[61] ITU-T Recommendation V.120: "Support by an ISDN of data terminal equipment with V-Series type interfaces with provision for statistical multiplexing".

[62] ITU-T Recommendation X.21: "Interface between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) for synchronous operation on public data networks".

[63] Void.

[64] Void.

[65] ITU-T Recommendation X.30: "Support of X.21, X.21 bis and X.20 bis based Data Terminal Equipments (DTEs) by an Integrated Services Digital Network (ISDN)".

[66] ITU-T Recommendation X.31: "Support of packet mode terminal equipment by an ISDN".

[67] Void.

[68] Void.

[69] ITU-T Recommendation X.121: "International numbering plan for public data networks".

[70] ETSI ETS 300 102-1: "Integrated Services Digital Network (ISDN); User-network interface layer 3; Specifications for basic call control".

[71] ETSI ETS 300 102-2: "Integrated Services Digital Network (ISDN); User-network interface layer 3; Specifications for basic call control; Specification Description Language (SDL) diagrams".

[72] ISO/IEC 10646: "Information technology -- Universal Multiple-Octet Coded Character Set (UCS)".

[73] 3GPP TS 22.060: "General Packet Radio Service (GPRS); Service Description; Stage 1".

[74] 3GPP TS 23.060: "General Packet Radio Service (GPRS); Service Description; Stage 2".

[75] 3GPP TS 43.064: "~~Digital cellular telecommunications system (Phase 2+);~~ General Packet Radio Service (GPRS); Overall description of the GPRS radio interface; Stage 2".

[76] 3GPP TS 44.060: "~~Digital cellular telecommunications system (Phase 2+);~~ General Packet Radio Service (GPRS); Mobile Station (MS) - Base Station System (BSS) interface; Radio Link Control/Medium Access Control (RLC/MAC) protocol".

[77] IETF RFC 1034: "Domain names - concepts and facilities".

[78] 3GPP TS 44.065: "~~Digital cellular telecommunications system (Phase 2+);~~ Mobile Station (MS) - Serving GPRS Support Node (SGSN); Subnetwork Dependent Convergence Protocol (SNDCP)".

[78a] 3GPP TS 44.064: "Mobile Station - Serving GPRS Support Node (MS-SGSN) Logical Link Control (LLC) Layer Specification".

[79] ITU Recommendation I.460: "Multiplexing, rate adaption and support of existing interfaces".

[80] 3GPP TS 26.111: "Codec for Circuit Switched Multimedia Telephony Service; Modifications to H.324".

[81] 3GPP TS 23.107: "Quality of Service (QoS) concept and architecture".

[82] 3GPP TS 43.022: "~~Digital cellular telecommunications system (Phase 2+);~~ Functions related to Mobile Station (MS) in idle mode and group receive mode".

[83] 3GPP TS 26.103: "Speech Codec List for GSM and UMTS".

[84] 3GPP TS 44.018: "Mobile radio interface layer 3 specification, Radio Resource Control Protocol".

[85] 3GPP TS 48.008: "Mobile-services Switching Centre – Base Station System (MSC – BSS) interface; layer 3 specification".

[86] 3GPP TS 48.018: "General Packet Radio Service (GPRS); Base Station System (BSS) - Serving GPRS Support Node (SGSN); BSS GPRS Protocol (BSSGP)".

[87] 3GPP TS 43.055: "Dual Transfer Mode (DTM); Stage 2".

[88] 3GPP TS 23.067: "enhanced Multi-Level Precedence and Pre-emption service (eMLPP); Stage 2".

[88a] 3GPP TS 23.093: "Technical realization of Completion of Calls to Busy Subscriber (CCBS); Stage 2".

[89] 3GPP TS 22.042: "Network Identity and Time Zone (NITZ), Stage 1".

[90] 3GPP TS 23.040: "Technical realization of Short Message Service (SMS)".

[91] 3GPP TS 44.056: "GSM Cordless Telephony System (CTS), (Phase 1) CTS Radio Interface Layer 3 Specification".

[92] 3GPP TS 23.226: "Global Text Telephony; Stage 2 "

[93] 3GPP TS 26.226: "Cellular Text Telephone Modem (CTM), General Description "

[94] 3GPP TS 23.236: "Intra Domain Connection of RAN Nodes to Multiple CN Nodes"

[95] 3GPP TS 24.229: "~~3~~rd ~~Generation Partnership Project; Technical Specification Group Core Network;~~ IP Multimedia Call Control Protocol based on SIP and SDP"

[96] 3GPP TS 23.205: "~~3rd Generation Partnership Project; Technical Specification Group Core Network;~~ Bearer-independent circuit-switched core network; Stage 2".

[97] 3GPP TS 23.172: "UDI/RDI Fallback and Service Modification; Stage 2".

[98] 3GPP TS 25.304: "~~3~~rd ~~Generation Partnership Project; Technical Specification Group Radio Access Network;~~ UE Procedures in Idle Mode and Procedures for Cell Reselection in Connected Mode"

[99] RFC 2373 (July 1998): "IP Version 6 Addressing Architecture".

[100] 3GPP TS 29.207: "Policy control over Go interface"

4.5.1.5 MM connection establishment for emergency calls

A MM connection for an emergency call may be established in all states of the mobility management sublayer which allow MM connection establishment for a normal originating call. In addition, establishment may be attempted in all service states where a cell is selected (see subclause 4.2.2) but not in the MM CONNECTION ACTIVE state (GROUP TRANSMIT MODE) state. However, as a network dependent option, a MM connection establishment for emergency call may be rejected in some of the states.

When a user requests an emergency call establishment the mobile station will send a CM SERVICE REQUEST message to the network with a CM service type information element indicating emergency call establishment. If the network does not accept the emergency call request, e.g., because IMEI was used as identification and this capability is not supported by the network, the network will reject the request by returning a CM SERVICE REJECT message to the mobile station.

The reject cause information element indicates the reason for rejection. The following cause values may apply:

#3 "Illegal MS"

#4 "IMSI unknown in VLR"

#5 "IMEI not accepted"

#6 "Illegal ME"

#17 "Network failure"

#22 "Congestion"

#32 "Service option not supported"

#34 "Service option temporarily out of order"

With the above defined exceptions, the procedures described for MM connection establishment in subclauses 4.5.1.1 and 4.5.1.2 shall be followed.

NOTE: Normally, the mobile station will be identified by an IMSI or a TMSI. However, if none of these identifiers is available in the mobile station, then the mobile station shall use the IMEI for identification purposes. The network may in that case reject the request by returning a CM SERVICE REJECT message with reject cause:

#5 "IMEI not accepted".

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 subclause 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 subclause 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 (3GPP TS 24.011), Call Independent Supplementary Services (3GPP TS 24.010 [21]) and Location Services (3GPP TS 44.071 [23a]~~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 subclause 4.3.3) may be invoked.

The network may invoke the authentication procedure (see subclause 4.3.2).

In GSM, the network decides if the security mode setting procedure shall be invoked (see 3GPP TS 44.018 [84] subclause 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 3GPP TS 25.331 [23c]). 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 subclause 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 subclause 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 subclause 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.

4.7.1.7 Intersystem change between GSM and UMTS

For the UMTS to GSM and GSM to UMTS intersystem change the following cases can be distinguished:

a) Intersystem change between cells belonging to different RA's:

The procedures executed by the MS depends on the network mode of operation in the old and new RA. If a change of the network operation mode has occurred in the new RA, then the MS shall behave as specified in subclause 4.7.1.6. If no change of the network operation mode has occurred in the new RA, then the MS shall initiate the normal or combined RA update procedure depending on the network operation mode in the current RA.

b) Intersystem change between cells belonging to the same RA:

If the READY timer is running in the MS in GSM or the MS is in PMM-CONNECTED mode in UMTS, then the MS shall perform a normal or combined RA update procedure depending on the network mode of operation in the current RA.

If the READY timer is not running in the MS in GSM or the MS is in PMM-IDLE mode in UMTS, then the MS shall not perform a RA update procedure (as long as the MS stays within the same RA) until up-link user data or signalling information needs to be sent from the MS to the network, except case c) is applicable.

- If the MS is in the same access network, GSM or UMTS, as when it last sent user data or signalling messages, the procedures defined for that access system shall be followed. This shall be sending of an LLC PDU in a GSM cell or initiating the SERVICE REQUEST procedure in a UMTS cell.

- If the MS is in a different access network, GSM or UMTS, as when it last sent user data or signalling messages, the normal or combined RA update procedure shall be performed depending on the network operation mode in the current RA, before the sending of user data or signalling messages. If the signalling message is a DETACH REQUEST containing cause "power off", the RA update procedure need not to be performed.

- If the periodic routing area update timer expires the MS shall initiate the periodic RA update procedure.

If the READY timer is not running in the network in GSM or the network is in PMM-IDLE mode in UMTS, then the network shall page the MS if down-link user data or signalling information needs to be sent from the network to the MS. This shall include both GSM and UMTS cells.

- If the MS receives the paging indication in the same access network, GSM or UMTS, as when it last sent user data or signalling information, the MS shall send any LLC PDU in a GSM cell or shall initiate the SERVICE REQUEST procedure indicating service type "paging response" in a UMTS cell.

- If the MS receives the paging indication in a different access network, GSM or UMTS, as when it last sent user data or signalling information, the normal or combined RA update procedure shall be performed depending on the network operation mode in the current RA.

c) Intersystem handover from GSM to UMTS during a CS connection:

After the successful completion of the handover from an GSM cell to an UMTS cell, an MS which has performed the GPRS suspension procedure in Gb mode (see 3GPP TS 44.018 [84]) (i.e. an MS in MS operation mode B or an DTM MS in a GSM cell that does not support DTM) shall perform a normal RA update procedure in the UMTS cell in order to resume the GPRS services in the network, before sending any other signalling messages or user data.

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.

4.7.6.3 P-TMSI reallocation completion by the network

Upon receipt of the P-TMSI REALLOCATION COMPLETE message, the network stops the timer T3350 and considers both the old and the 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 subclause 4.7.1.5).

In GSM, the GMM layer shall notify the LLC layer that the P-TMSI has been changed (see 3GPP TS 44.064 [78a]~~04.64 [76]~~).

4.7.7.2 Authentication and ciphering response by the MS

In GSM, a MS that is attached to GPRS shall be ready to respond upon an AUTHENTICATION_AND_CIPHERING REQUEST message at any time.

In UMTS, an MS that is attached to GPRS shall be ready to respond upon an AUTHENTICATION_AND_CIPHERING REQUEST message at any time whilst a PS signalling connection exists.

A MS which does not support the UMTS authentication algorithm shall ignore the Authentication Parameter AUTN IE if included in the AUTHENTICATION_AND_CIPHERING REQUEST message and perform the GSM authentication challenge. It shall not perform the authentication of the network described in 4.7.7.5.1.

In a GSM authentication challenge, if the AUTHENTICATION_AND_CIPHERING REQUEST message includes the authentication parameters RAND and GPRS CKSN, then upon receipt of the message, the MS processes the challenge information and sends an AUTHENTICATION_AND_CIPHERING RESPONSE message to the network. The value of the received A&C reference number information element shall be copied into the A&C reference number information element in the AUTHENTICATION_AND_CIPHERING RESPONSE message. A GSM authentication challenge will result in the SIM passing a SRES and a GPRS GSM ciphering key to the ME. The new GPRS GSM ciphering key calculated from the challenge information shall overwrite the previous one and any previously stored GPRS UMTS ciphering and GPRS UMTS integrity keys shall be deleted. The calculated GSM ciphering key shall be stored on the SIM together with the GPRS ciphering key sequence number before the AUTHENTICATION_AND_CIPHERING RESPONSE message is transmitted.

In a UMTS authentication challenge, if the AUTHENTICATION_AND_CIPHERING REQUEST message includes the UMTS authentication parameters GPRS CKSN, RAND and AUTN, then upon receipt of the message, the MS verifies the AUTN parameter and if this is accepted, the MS processes the challenge information and sends an AUTHENTICATION_AND_CIPHERING RESPONSE message to the network. The value of the received A&C reference number information element shall be copied into the A&C reference number information element in the AUTHENTICATION_AND_CIPHERING RESPONSE message. A UMTS authentication challenge will result in the SIM passing a RES, a GPRS UMTS ciphering key, a GPRS UMTS integrity key and a GPRS GSM ciphering key to the ME. The new GPRS UMTS ciphering key, GPRS UMTS integrity key and GPRS GSM ciphering key calculated from the challenge information shall overwrite the previous ones. The new GPRS UMTS ciphering key, GPRS UMTS integrity key and GPRS GSM ciphering key shall be stored on the SIM together with the GPRS ciphering key sequence number before the AUTHENTICATION_AND_CIPHERING RESPONSE message is transmitted.

In UMTS, an MS capable of UMTS only shall ignore the Ciphering Algorithm IE in the AUTHENTICATION_AND_CIPHERING REQUEST message. An MS capable of both UMTS and GSM shall store the received value in the Ciphering Algorithm IE in the AUTHENTICATION_AND_CIPHERING REQUEST message in order to use it at an inter system change from UMTS to GSM.

If the AUTHENTICATION_AND_CIPHERING REQUEST message does not include neither the GSM authentication parameters (RAND and GPRS CKSN) nor the UMTS authentication parameters (RAND, AUTN and GPRS CKSN), then upon receipt of the message, the MS replies by sending an AUTHENTICATION_AND_CIPHERING RESPONSE message to the network.

In GSM, the GMM layer shall notify the LLC layer if ciphering shall be used or not and if yes which GSM ciphering algorithm and GPRS GSM ciphering key that shall be used (see 3GPP TS 44.064 [78a]~~04.64 [76]~~).

A ME supporting UMTS authentication challenge shall support the following procedure:

In order to avoid a synchronisation failure, if the same RAND is received twice, the mobile station shall store the received RAND together with the RES returned from the SIM in the volatile memory and compare it with any subsequently received RAND values, until the RAND value stored in the mobile station is deleted. If the stored RAND value is equal to the new received value in the AUTHENTICATION_AND_CIPHERING REQUEST message, then the mobile station shall not pass the RAND to the SIM, but shall immediately send the AUTHENTICATION_AND_CIPHERING RESPONSE message with the stored RES. If there is no valid stored RAND in the mobile station or the stored RAND is different from the new received value in the AUTHENTICATION_AND_CIPHERING REQUEST message, the mobile station shall pass the RAND to the SIM, shall override any previously stored RAND and RES with the new ones and start**,** or reset and restart timer T3316.

The RAND and RES values stored in the mobile station shall be deleted and timer T3316, if running, shall be stopped:

- upon receipt of a SECURITY MODE COMMAND (Iu mode only)**,**
  SERVICE_ACCEPT (Iu mode only)**,**
  SERVICE_REJECT (Iu mode only)**,**
  ROUTING_AREA_UPDATE_ACCEPT
  or AUTHENTICATION_AND_CIPHERING REJECT message;

- upon expiry of timer T3316; or

- if the mobile station enters the GMM states GMM-DEREGISTERED or GMM-NULL.

4.7.7.3 Authentication and ciphering completion by the network

Upon receipt of the AUTHENTICATION AND CIPHERING RESPONSE message, the network stops the timer T3360 and checks the validity of the response (see 3GPP TS 43.020 [13] and 3GPP TS 33.102). For this, it may use the A&C reference number information element within the AUTHENTICATION AND CIPHERING RESPONSE message to determine whether the response is correlating to the last request that was sent.

In GSM, the GMM layer shall notify the LLC sublayer if ciphering shall be used or not and if yes which algorithm and GPRS GSM ciphering key that shall be used (see 3GPP TS 44.064 [78a]~~04.64 [76]~~).

Upon receipt of the AUTHENTICATION AND CIPHERING FAILURE message, the network stops the timer T3360. In Synch failure case, the core network may renegotiate with the HLR/AuC and provide the MS with new authentication parameters.

4.7.7.8 Handling of keys at intersystem change from UMTS to GSM

At an intersystem change from UMTS to GSM, ciphering may be started (see 3GPP TS 44.064 [78a]~~04.64 [76]~~) without any new authentication and ciphering procedure. Deduction of the appropriate security key for ciphering in GSM, depends on the current GSM/UMTS security context stored in the MS and the network.

The ME shall handle the GPRS GSM ciphering key according to table 4.7.7.8.1.

Before any initial GMM message is sent in the new cell in GSM, the GMM layer in the MS shall notify the LLC layer if ciphering shall be used or not. If yes, the GPRS GSM ciphering key and the applicable ciphering algorithm according to the stored *Ciphering Algorithm IE* in the MS shall also be indicated to the LLC layer (see 3GPP TS 44.064 [78a]~~04.64 [76]~~).

Table 4.7.7.8.1/3GPP TS 24.008: Intersystem change from UMTS to GSM

Security context established in MS and network in UMTS	At intersystem change to GSM:
GSM security context	An ME shall apply the GPRS GSM cipher key received from the GSM security context residing in the SIM.
UMTS security context	An ME shall apply the GPRS GSM cipher key derived by the SIM from the GPRS UMTS cipher key and the GPRS UMTS integrity key.

NOTE A SIM with UMTS security context, passes the GPRS UMTS ciphering key, the GPRS UMTS integrity key and the derived GPRS GSM ciphering key to the ME independent on the current radio access being UMTS or GSM.

5.2.1.10 Call queuing at mobile originating call establishment

~~The conditions to apply queuing are described in 3GPP TS 03.01 [9].~~

If an idle traffic channel is not available at the assignment instant, the network may place the traffic channel request in a queue. Calls arriving when all positions in the queue are occupied shall be cleared by the network using the cause #34 "no circuit/channel available".

The maximum queuing interval is supervised by the network. The limit is a network dependent choice. In case the network is not able to allocate a traffic channel within the queuing limit, the network will release the call using cause #34 "no circuit/channel available".

Optionally, e.g. if eMLPP is used, the network may decide to pre-empt existing calls or to place the traffic channel request at some preferential position within the queue.

Specific indications provided in the network to the remote user are a network dependent choice.

5.2.2.3.3 Call failure procedures

In case of abnormal behaviour the following call failure procedures apply:

i. If the network does not receive any response to the SETUP message prior to the expiration of timer T303, then the network shall: initiate clearing procedures towards the calling user with cause #18 "no user responding"; and initiate clearing procedures towards the called mobile station in accordance with subclause 5.4.4 using cause #102 "recovery on timer expiry".

ii. If the network has received a CALL CONFIRMED message, but does not receive an ALERTING, CONNECT or DISCONNECT message prior to the expiration of timer T310, then the network shall:

- initiate clearing procedures towards the calling user with cause #18 "no user responding"; and
- initiate clearing procedures towards the called MS in accordance with subclause 5.4.4 using cause #102 "recovery on timer expiry".

iii. If the network has received an ALERTING message, but does not receive a CONNECT or DISCONNECT message prior to the expiry of timer T301 (or a corresponding internal alerting supervision timing function), then the network shall: initiate clearing procedures towards the calling user with cause #19 "user alerting, no answer"; and initiate clearing procedures towards the called mobile station in accordance with subclause 5.4.4, using cause #102 "recovery on timer expiry" or using cause #31 "normal, unspecified".

NOTE: The choice between cause #31 and cause #102 may have consequences on indications generated by the mobile station, see 3GPP TS 22.001~~02.40~~ [8a].

6.1.2 Session management states

In this subclause, the SM states are described for one SM entity (see 3GPP TS 24.007 [20]). Each SM entity is associated with one PDP context. Subclause 6.1.2.1 describes the SM states in the MS and subclause 6.1.2.2 describes the SM states on the network side.

7 Examples of structured procedures

See 3GPP TS 23.108 [9a].

8.1 General

The procedures specified in 3GPP TS 24.008 and call-related supplementary service handling in 3GPP TS 24.010 [21] apply to those messages which pass the checks described in this subclause.

This subclause also specifies procedures for the handling of unknown, unforeseen, and erroneous protocol data by the receiving entity. These procedures are called "error handling procedures", but in addition to providing recovery mechanisms for error situations they define a compatibility mechanism for future extensions of the protocols.

Error handling concerning the value part of the Facility IE and of the SS Version Indicator IE are not in the scope of the present document. It is defined in 3GPP TS 24.010 [21] and the 3GPP TS 24.08~~04.8~~x series.

Sub subclauses 8.1 to 8.8 shall be applied in order of precedence.

Most error handling procedures are mandatory for the mobile station.

Detailed error handling procedures in the network are implementation dependent and may vary from PLMN to PLMN. However, when extensions of this protocol are developed, networks will be assumed to have the error handling that is indicated in this subclause as mandatory ("shall") and that is indicated as strongly recommended ("should"). Subclauses 8.2, 8.3, 8.4, 8.5 and 8.7.2 do not apply to the error handling in the network applied to the receipt of initial layer 3 message: If the network diagnoses an error described in one of these subclause s in the initial layer 3 message received from the mobile station, it shall either:

- try to recognize the classmark and then take further implementation dependent actions; or
- release the RR-connection.

Also, the error handling of the network is only considered as mandatory or strongly recommended when certain thresholds for errors are not reached during a dedicated connection.

For definition of semantical and syntactical errors see 3GPP TS 24.007 [20], subclause 11.4.2.

8.8 Messages with semantically incorrect contents

When a message with semantically incorrect contents is received, the foreseen reactions of the procedural part of 3GPP TS 24.008 (i.e. of clauses 3, 4, 5) are performed. If however no such reactions are specified, the MS shall ignore the message except for the fact that, if an RR connection exists, it returns a status message (STATUS, or MM STATUS depending on the PD) with cause value # 95 "semantically incorrect message".

The network should follow the same procedure except that a status message is not normally transmitted.

Semantic checking of the Facility information element value part (defined in 3GPP TS 24.080 [24]) is the subject of the technical specifications 3GPP TS 24.010 [21] and the 3GPP TS 24.08~~04.8~~x series.

9.3.23 Setup

9.3.23.1 Setup (mobile terminated call establishment)

This message is sent by the network to the mobile station to initiate a mobile terminated call establishment.

See table 9.70/3GPP TS 24.008.

Message type: SETUP

Significance: global

Direction: network to mobile station

Table 9.70/3GPP TS 24.008: SETUP 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
	Setup Message type	Message type 10.4	M	V	1
D-	BC 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
34	Signal	Signal 10.5.4.23	O	TV	2
5C	Calling party BCD Number	Calling party BCD num. 10.5.4.9	O	TLV	3-14
5D	Calling party sub-Address	Calling party subaddr. 10.5.4.10	O	TLV	2-23
5E	Called party BCD Number	Called party BCD num. 10.5.4.7	O	TLV	3-19
6D	Called party sub-Address	Called party subaddr. 10.5.4.8	O	TLV	2-23
74	Redirecting party BCD number	Redirecting party BCD num. 10.5.4.21a	O	TLV	3-19
75	Redirecting party sub-address	Redirecting party subaddress. 10.5.4.21b	O	TLV	2-23
D-	LLC repeat indicator	Repeat indicator 10.5.4.22	O	TV	1
7C	Low layer Compatibility I	Low layer comp. 10.5.4.18	O	TLV	2-18
7C	Low layer Compatibility II	Low layer comp. 10.5.4.18	C	TLV	2-18
D-	HLC repeat indicator	Repeat indicator 10.5.4.22	O	TV	1
7D	High layer Compatibility i	High layer comp. 10.5.4.16	O	TLV	2-5
7D	High layer Compatibility ii	High layer comp. 10.5.4.16	C	TLV	2-5
7E	User-user	User-user 10.5.4.25	O	TLV	3-35
8-	Priority	Priority Level 10.5.1.11	O	TV	1
19	Alert	Alerting Pattern 10.5.4.26	O	TLV	3
2F	Network Call Control Capabilities	Network Call Control cap. 10.5.4.29	O	TLV	3
3A	Cause of No CLI	Cause of No CLI 10.5.4.30	O	TLV	3
41	Backup bearer capability	Backup bearer capability 10.5.4.4a	O	TLV	3-15

9.3.23.1.1 BC repeat indicator

The *BC repeat indicator* information element is included if and only if *bearer capability* 1 information element and *bearer capability 2* IE are both present in the message.

9.3.23.1.2 Bearer capability 1 and bearer capability 2

The *bearer capability 1* information element may be omitted in the case where the mobile subscriber is allocated only one directory number for all services (ref.: 3GPP TS 29.007 [38]). The *bearer capability 2* IE is missing at least if the *bearer capability 1* IE is missing.

If the MSC wishes to indicate capability for an altenative call mode, which can be entered through fallback, this is indicated by adding a *bearer capability information ele*ment (bearer capability) 2 element (see subclause 5.3.6).

9.3.23.1.3 Facility

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

9.3.23.1.4 Progress indicator

This information element is 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 MS attach the user connection for speech.

9.3.23.1.4a Called party BCD number

For all bands except for PCS1900, the maximum length of this IE sent by the network shall be 13 octets

9.3.23.1.5 Called party subaddress

Included in the Network-to-mobile station direction if the calling user includes a *called party subaddress* information element in the SETUP message.

9.3.23.1.6 LLC repeat indicator

The *LLC repeat indicator* information element is included if and only if both following conditions hold:

- The *BC repeat indicator* IE is contained in the message.
- The *low layer compatibility I* IE is contained in the message.

If included, the *LLC repeat indicator* shall specify the same repeat indication as the *BC repeat indicator* IE.

9.3.23.1.7 Low layer compatibility I

Included in the network-to-mobile station direction if the calling user specified a low layer compatibility.

9.3.23.1.8 Low layer compatibility II

Included if and only if the *LLC repeat indicator* information element is contained in the message.

9.3.23.1.9 HLC repeat indicator

The *HLC repeat indicator* information element is included if and only both following conditions hold:

- The *BC repeat indicator* IE is contained in the message.
- The *high layer compatibility i* IE is contained in the message.

If included, the *HLC repeat indicator* shall specify the same repeat indication as the *BC repeat indicator* IE.

9.3.23.1.10 High layer compatibility i

Included in the network-to-mobile station direction if the calling user specified a high layer compatibility.

9.3.23.1.11 High layer compatibility ii

Included if and only if the *HLC repeat indicator* information element is contained in the message.

9.3.23.1.12 User-user

May be included in the network to called mobile station direction when the calling remote user included a user-user information element in the SETUP message.

9.3.23.1.13 Redirecting party BCD number

May be included in the network to called mobile station direction when the call has been redirected.

9.3.23.1.14 Redirecting party subaddress

May be included in the network to called mobile station direction when the calling remote user included a called party subaddress in the SETUP message and the call has been redirected

9.3.23.1.15 Priority

May be included by the network to indicate the priority of the incoming call if eMLPP is used.

9.3.23.1.16 Alert $(Network Indication of Alerting in the MS)$

May be included by the network to give some indication about alerting (category or level). If supported in the MS, this optional indication is to be used by the MS as specified in 3GPP TS 22.101 [8]~~02.07~~.

9.3.23.1.17 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.

9.3.23.1.18 Cause of No CLI

This IE may be included by the network as defined by 3GPP TS 24.081 [25].

When both Calling Party BCD number IE and Cause of No CLI IE are included in SETUP message then the Cause of No CLI IE provides additional information on why the number digits are not present.

9.3.23.1.19 Backup bearer capability

The *backup bearer capability* IE may be included by the network only if there are no *bearer capability* IEs contained in the message.

NOTE: The MSC may use the *backup bearer capability* IE if it is not able to provide a complete *bearer capability* IE.

10.1 Overview

Within the Layer 3 protocols defined in 3GPP TS 24.0~~1~~08, every message is a standard L3 message as defined in 3GPP TS 24.007 [20]. This means that the message consists of the following parts:

a) protocol discriminator;

b) transaction identifier;

c) message type;

d) other information elements, as required.

This organization is illustrated in the example shown in figure 10.1/3GPP TS 24.008.

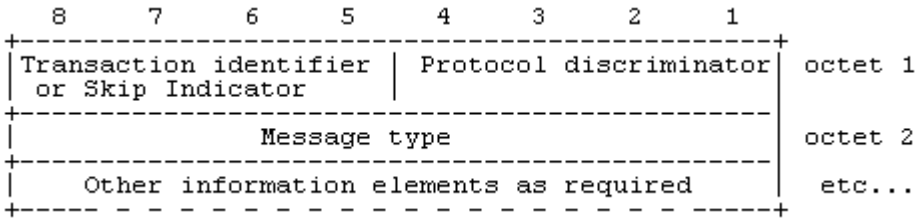

Figure 10.1/3GPP TS 24.008 General message organization example

Unless specified otherwise in the message descriptions of clause 9, a particular information element shall not be present more than once in a given message.

The term "default" implies that the value defined shall be used in the absence of any assignment, or that this value allows negotiation of alternative values in between the two peer entities.

When a field extends over more than one octet, the order of bit values progressively decreases as the octet number increases. The least significant bit of the field is represented by the lowest numbered bit of the highest numbered octet of the field.

10.5.1.6 Mobile Station Classmark 2

The purpose of the *Mobile Station Classmark 2* information element is to provide the network with information concerning aspects of both high and low priority of the mobile station equipment. This affects the manner in which the network handles the operation of the mobile station. The Mobile Station Classmark information indicates general mobile station characteristics and it shall therefore, except for fields explicitly indicated, be independent of the frequency band of the channel it is sent on.

The *Mobile Station Classmark 2* information element is coded as shown in figure 10.5.6/3GPP TS 24.008, table 10.5.6a/3GPP TS 24.008 and table 10.5.6b/3GPP TS 24.008.

The *Mobile Station Classmark 2* is a type 4 information element with 5 octets length.

8	7	6	5	4	3	2	1	
	Mobile station classmark 2 IEI							octet 1
Length of mobile station classmark 2 contents								octet 2
0 spare	Revision level		ES IND	A5/1	RF power capability			octet 3
0 spare	PS capa.	SS Screen. Indicator		SM ca pabi.	VBS	VGCS	FC	octet 4
CM3	0 spare	LCSVA CAP	UCS2	SoLSA	CMSP	A5/3	A5/2	octet 5

NOTE: Owing to backward compatibility problems, bit 8 of octet 4 should not be used unless it is also checked that the bits 8, 7 and 6 of octet 3 are not "0 0 0".

Figure 10.5.6/3GPP TS 24.008 *Mobile Station Classmark 2* information element

Table 10.5.6a/3GPP TS 24.008: *Mobile Station Classmark 2* information element

Revision level (octet 3)
Bits
7 6
0 0 Reserved for GSM phase 1
0 1 Used by GSM phase 2 mobile stations
1 0 Used by mobile stations supporting R99 or later versions of the protocol
1 1 Reserved for future use

ES IND (octet 3, bit 5) "Controlled Early Classmark Sending" option implementation
AN MS not supporting GSM shall set this bit to '0'.
An MS supporting GSM shall indicate the associated GSM capability (see table):

0 "Controlled Early Classmark Sending" option is not implemented in the MS
1 "Controlled Early Classmark Sending" option is implemented in the MS

NOTE: The value of the ES IND gives the implementation in the MS. It's value is **not** dependent on the broadcast SI 3 Rest Octet <Early Classmark Sending Control> value

A5/1 algorithm supported (octet 3, bit 4)
An MS not supporting GSM shall set this bit to '1'.
An MS supporting GSM shall indicate the associated GSM capability (see table)

0 encryption algorithm A5/1 available
1 encryption algorithm A5/1 not available

RF Power Capability (Octet 3)
When GSM 450, GSM 480, GSM 700, GSM 850, GSM 900 P, E [or R] band is used (for exceptions see 3GPP TS 44.018), the MS shall indicate the RF power capability of the band used (see table).
When UMTS is used, a single band GSM 450, GSM 480, GSM 700, GSM 850, GSM 900 P, E [or R] MS shall indicate the RF power capability corresponding to the (GSM) band it supports (see table). In this case, information on which single band is supported is found in classmark 3.
Bits
3 2 1
0 0 0 class 1
0 0 1 class 2
0 1 0 class 3
0 1 1 class 4
1 0 0 class 5
All other values are reserved.

When the DCS 1800 or PCS 1900 band is used (for exceptions see 3GPP TS 44.018) The MS shall indicate the RF power capability of the band used (see table).
When UMTS is used, a single band DCS 1800 or PCS 1900 MS shall indicate the RF power capability corresponding to the (GSM) band it supports (see table). In this case, information on which single band is supported is found in classmark 3
Bits
3 2 1
0 0 0 class 1
0 0 1 class 2
0 1 0 class 3
All other values are reserved.

When UMTS is used, an MS not supporting any GSM band or a multiband GSM MS shall code this field as follows (see table):
Bits
3 2 1
1 1 1 RF Power capability is irrelevant in this information element
All other values are reserved.

Table 10.5.6a/3GPP TS 24.008: *Mobile Station Classmark 2* information element

PS capability (pseudo-synchronization capability) (octet 4)
An MS not supporting GSM shall set this bit to '0'.
An MS supporting GSM shall indicate the associated GSM capability (see table):
Bit **7**
0 PS capability not present
1 PS capability present

SS Screening Indicator (octet 4)
Bits
6 5
0 0 defined in 3GPP TS 24.080
0 1 defined in 3GPP TS 24.080
1 0 defined in 3GPP TS 24.080
1 1 defined in 3GPP TS 24.080

SM capability (MT SMS pt to pt capability) (octet 4)
Bit **4**
0 Mobile station does not support mobile terminated point to point SMS
1 Mobile station supports mobile terminated point to point SMS

VBS notification reception (octet 4)
An MS not supporting GSM shall set this bit to '0'.
An MS supporting GSM shall indicate the associated GSM capability (see table):
Bit **3**
0 no VBS capability or no notifications wanted
1 VBS capability and notifications wanted

VGCS notification reception (octet 4)
An MS not supporting GSM shall set this bit to '0'.
An MS supporting GSM shall indicate the associated GSM capability (see table):
Bit **2**
0 no VGCS capability or no notifications wanted
1 VGCS capability and notifications wanted

FC Frequency Capability (octet 4)
When the GSM 400, or GSM 700, or GSM 850, or DCS 1800, or PCS 1900 band or UMTS is used (for exceptions see 3GPP TS 44.018), for definitions of frequency band see 3GPP TS 45.005), this bit shall be sent with the value '0'.

Note: This bit conveys no information about support or non support of the E-GSM or R-GSM bands when GSM 400, GSM 700, GSM 850, DCS 1800, PCS 1900 band or UMTS is used.

When a GSM 900 band is used (for exceptions see 3GPP TS 44.018):
Bit **1**
0 The MS does not support the E-GSM or R-GSM band (For definition of frequency bands see 3GPP TS 45.005 [33])
1 The MS does support the E-GSM or R-GSM (For definition of frequency bands see 3GPP TS 45.005 [33])
NOTE: For mobile station supporting the R-GSM band further information can be found in MS Classmark 3.

Table 10.5.6a/3GPP TS 24.008: *Mobile Station Classmark 2* information element

CM3 (octet 5, bit 8) 0 The MS does not support any options that are indicated in CM3 1 The MS supports options that are indicated in classmark 3 IE LCS VA capability (LCS value added location request notification capability) (octet 5,bit 6) 0 LCS value added location request notification capability not supported 1 LCS value added location request notification capability supported UCS2 treatment (octet 5, bit 5) This information field indicates the likely treatment by the mobile station of UCS2 encoded character strings. For backward compatibility reasons, if this field is not included, the value 0 shall be assumed by the receiver. 0 the ME has a preference for the default alphabet (defined in 3GPP TS 23.038 [8b]~~03.38~~) over UCS2. 1 the ME has no preference between the use of the default alphabet and the use of UCS2.
SoLSA (octet 5, bit 4) An MS not supporting GSM shall set this bit to '0'. An MS supporting GSM shall indicate the associated GSM capability (see table): 0 The ME does not support SoLSA. 1 The ME supports SoLSA. CMSP: CM Service Prompt (octet 5, bit 3) $(CCBS)$ 0 "Network initiated MO CM connection request" not supported. 1 "Network initiated MO CM connection request" supported for at least one CM protocol. A5/3 algorithm supported (octet 5, bit 2) An MS not supporting GSM shall set this bit to '0'. An MS supporting GSM shall indicate the associated GSM capability (see table): 0 encryption algorithm A5/3 not available 1 encryption algorithm A5/3 available A5/2 algorithm supported (octet 5, bit 1) An MS not supporting GSM shall set this bit to '0'. An MS supporting GSM shall indicate the associated GSM capability (see table): 0 encryption algorithm A5/2 not available 1 encryption algorithm A5/2 available

NOTE: Additional mobile station capability information might be obtained by invoking the classmark interrogation procedure when GSM is used.

10.5.1.7 Mobile Station Classmark 3

The purpose of the *Mobile Station Classmark 3* information element is to provide the network with information concerning aspects of the mobile station. The contents might affect the manner in which the network handles the operation of the mobile station. The Mobile Station Classmark information indicates general mobile station characteristics and it shall therefore, except for fields explicitly indicated, be independent of the frequency band of the channel it is sent on.

The *MS Classmark 3* is a type 4 information element with a maximum of 14 octets length.

The value part of a *MS Classmark 3* information element is coded as shown in figure 10.5.7/3GPP TS 24.008 and table 10.5.7/3GPP TS 24.008.

NOTE: The 14 octet limit is so that the CLASSMARK CHANGE message will fit in one layer 2 frame.

SEMANTIC RULE: a multiband mobile station shall provide information about all frequency bands it can support. A single band mobile station shall not indicate the band it supports in the *Multiband Supported, GSM 400 Bands Supported, GSM 700 Associated Radio Capability, GSM 850 Associated Radio Capability* or PCS *1900 Associated Radio Capability* fields in the MS Classmark 3. Due to shared radio frequency channel numbers between DCS 1800 and PCS 1900, the mobile should indicate support for either DCS 1800 band OR PCS 1900 band.

SEMANTIC RULE: a mobile station shall include the MS Measurement Capability field if the *Multi Slot Class* field contains a value of 19 or greater (see 3GPP TS 45.002 [32]).

Typically, the number of spare bits at the end is the minimum to reach an octet boundary. The receiver may add any number of bits set to "0" at the end of the received string if needed for correct decoding.

```
<Classmark 3 Value part> ::=
    < spare bit >
    {    < Multiband supported : { 000 } >
             < A5 bits >
    |    < Multiband supported : { 101 | 110 } >
             < A5 bits >
             < Associated Radio Capability 2 : bit(4) >
             < Associated Radio Capability 1 : bit(4) >
    |    < Multiband supported : { 001 | 010 | 100 } >
             < A5 bits >
             < spare bit >(4)
             < Associated Radio Capability 1 : bit(4) > }
    { 0 | 1 < R Support > }
    { 0 | 1 < HSCSD Multi Slot Capability > }
    < UCS2 treatment: bit >
    < Extended Measurement Capability : bit >
    { 0 | 1 < MS measurement capability > }
    { 0 | 1 < MS Positioning Method Capability > }
    { 0 | 1 < ECSD Multi Slot Capability > }
    { 0 | 1 < ECSD Struct > }
    { 0 | 1 < GSM 400 Bands Supported : { 01 | 10 | 11 } >
             < GSM 400 Associated Radio Capability: bit(4) > }

    { 0 | 1 <GSM 850 Associated Radio Capability : bit(4) > }
    { 0 | 1 <PCS 1900 Associated Radio Capability : bit(4) > }
    < UMTS FDD Radio Access Technology Capability : bit >
    < UMTS 3.84 Mcps TDD Radio Access Technology Capability : bit >
    < CDMA 2000 Radio Access Technology Capability : bit >

    { 0 | 1  < DTM GPRS Multi Slot Class : bit(2) >
             < MAC Mode Support : bit >
             {0 | 1< DTM EGPRS Multi Slot Class : bit(2) > } }
    { 0 | 1 < Single Band Support > } -- Release 4 starts here:
    { 0 | 1 <GSM 700 Associated Radio Capability : bit(4)>}

    < UMTS 1.28 Mcps TDD Radio Access Technology Capability : bit >
    < GERAN Feature Package 1 : bit >

    { 0 | 1 < Extended DTM GPRS Multi Slot Class : bit(2) >
             < Extended DTM EGPRS Multi Slot Class : bit(2) > }

    < GERAN Iu Mode Capability : bit >

    < spare bit > ;

< A5 bits > ::=
    < A5/7 : bit > < A5/6 : bit > < A5/5 : bit > < A5/4 : bit >  ;

<R Support>::=
    < R-GSM band Associated Radio Capability : bit(3) > ;

< HSCSD Multi Slot Capability > ::=
    < HSCSD Multi Slot Class : bit(5) >  ;

< MS Measurement capability > ::=
    < SMS_VALUE : bit (4) >
    < SM_VALUE : bit (4) > ;

< MS Positioning Method Capability > ::=
    < MS Positioning Method : bit(5) > ;

< ECSD Multi Slot Capability > ::=
    < ECSD Multi Slot Class : bit(5) > ;

 < EDGE Struct> : :=
    < Modulation Capability : bit >
```

```
    { 0 | 1 < EDGE RF Power Capability 1: bit(2) > }
    { 0 | 1 < EDGE RF Power Capability 2: bit(2) > }

< Single Band Support > ::=
    < GSM Band : bit (4) > ;
```

Figure 10.5.7/3GPP TS 24.008 *Mobile Station Classmark 3* information element

Table 10.5.7/3GPP TS 24.008: *Mobile Station Classmark 3* information element

Multiband Supported (3 bit field)

Band 1 supported (third bit of the field)
Bit 3
0 P-GSM not supported
1 P-GSM supported

Band 2 supported (second bit of the field)
Bit 2
0 E-GSM or R-GSM not supported
1 E-GSM or R-GSM supported

Band 3 supported (first bit of the field)
Bit 1
0 DCS 1800 not supported
1 DCS 1800 supported

The indication of support of P-GSM band or E-GSM or R-GSM band is mutually exclusive.

When the 'Band 2 supported' bit indicates support of E-GSM or R-GSM, the presence of the <R Support> field, see below, indicates if the E-GSM or R-GSM band is supported.

In this version of the protocol, the sender indicates in this field either none, one or two of these 3 bands supported.

For single band mobile station or a mobile station supporting none of the GSM 900 bands(P-GSM, E-GSM and R-GSM) and DCS 1800 bands, all bits are set to 0.

A5/4
0 Encryption algorithm A5/4 not available
1 Encryption algorithm A5/4 available

A5/5
0 Encryption algorithm A5/5 not available
1 Encryption algorithm A5/5 available

A5/6
0 Encryption algorithm A5/6 not available
1 Encryption algorithm A5/6 available

A5/7
0 Encryption algorithm A5/7 not available
1 Encryption algorithm A5/7 available

Associated Radio capability 1 and 2 (4 bit fields)

If either of P-GSM or E-GSM or R-GSM is supported, the radio capability 1 field indicates the radio capability for P-GSM, E-GSM or R-GSM, and the radio capability 2 field indicates the radio capability for DCS1800 if supported, and is spare otherwise.

If none of P-GSM or E-GSM or R-GSM are supported, the radio capability 1 field indicates the radio capability for DCS1800, and the radio capability 2 field is spare.

The radio capability contains the binary coding of the power class associated with the band indicated in multiband support bits (see 3GPP TS 45.005 [33]).

(continued...)

Table 10.5.1.7/3GPP TS 24.008 (continued): *MS Classmark 3* information element

R-GSM band Associated Radio Capability (3 bit field)

In case where the R-GSM band is supported the R-GSM band associated radio capability field contains the binary coding of the power class associated (see GSM 45.005) (regardless of the number of GSM bands supported). A mobile station supporting the R-GSM band shall also when appropriate, (see 10.5.1.6) indicate its support in the 'FC' bit in the Mobile Station Classmark 2 information element.

NOTE: The coding of the power class for P-GSM, E-GSM, R-GSM and DCS 1800 in radio capability 1 and/or 2 is different to that used in the Mobile Station Classmark 1 and Mobile Station Classmark 2 information elements.

HSCSD Multi Slot Class (5 bit field)

In case the MS supports the use of multiple timeslots for HSCSD then the HSCSD Multi Slot Class field is coded as the binary representation of the multislot class defined in 3GPP TS 45.002 [32].

UCS2 treatment (1 bit field)

This information field indicates the likely treatment by the mobile station of UCS2 encoded character strings. If not included, the value 0 shall be assumed by the receiver.

0 the ME has a preference for the default alphabet (defined in 3GPP TS 23.038 [8b]~~03.38~~) over UCS2.
1 the ME has no preference between the use of the default alphabet and the use of UCS2.

Extended Measurement Capability (1 bit field)

This bit indicates whether the mobile station supports 'Extended Measurements' or not

0 the MS does not support Extended Measurements
1 the MS supports Extended Measurements

SMS_VALUE (Switch-Measure-Switch) (4 bit field)
The SMS field indicates the time needed for the mobile station to switch from one radio channel to another, perform a neighbour cell power measurement, and the switch from that radio channel to another radio channel.
Bits

4 3 2 1	
0 0 0 0	1/4 timeslot (~144 microseconds)
0 0 0 1	2/4 timeslot (~288 microseconds)
0 0 1 0	3/4 timeslot (~433 microseconds)
. . .	
1 1 1 1	16/4 timeslot (~2307 microseconds)

SM_VALUE (Switch-Measure) (4 bit field)
The SM field indicates the time needed for the mobile station to switch from one radio channel to another and perform a neighbour cell power measurement.
Bits

4 3 2 1	
0 0 0 0	1/4 timeslot (~144 microseconds)
0 0 0 1	2/4 timeslot (~288 microseconds)
0 0 1 0	3/4 timeslot (~433 microseconds)
. . .	
1 1 1 1	16/4 timeslot (~2307 microseconds)

MS Positioning Method (5 bit field)
This field indicates the Positioning Method(s) supported by the mobile station for the provision of location services (LCS) via the CS domain in A-mode.
MS assisted E-OTD
Bit 5

0 MS assisted E-OTD not supported
1 MS assisted E-OTD supported

Table 10.5.1.7/3GPP TS 24.008 (continued): *MS Classmark 3* information element

MS based E-OTD
Bit 4
0 MS based E-OTD not supported
1 MS based E-OTD supported

MS assisted GPS
Bit 3
0 MS assisted GPS not supported
1 MS assisted GPS supported

MS based GPS
Bit 2
0 MS based GPS not supported
1 MS based GPS supported

MS Conventional GPS
Bit 1
0 conventional GPS not supported
1 conventional GPS supported

ECSD Multi Slot class (5 bit field)

In case the **ECSD** MS supports the use of multiple timeslots and the number of supported time slots is different from number of time slots supported for GMSK then the **ECSD** Multi Slot class field is included and is coded as the binary representation of the multislot class defined in 3GPP TS 45.002 [32].

Modulation Capability

The Modulation Capability field indicates the modulation scheme the MS supports in addition to GMSK.
0 8-PSK supported for downlink reception only
1 8-PSK supported for uplink transmission and downlink reception

EDGE RF Power Capability 1 (2 bit field)
If 8-PSK modulation is supported for both uplink and downlink, the **EDGE RF Power Capability 1** field indicates the radio capability for 8-PSK modulation in GSM 400, GSM700, GSM850 or GSM900.

EDGE RF Power Capability 2 (2 bit field)
If 8-PSK modulation is supported for both uplink and downlink, the **EDGE RF Power Capability 2** field indicates the radio capability for 8-PSK modulation in DCS1800 or PCS1900 if supported, and is not included otherwise.

The respective **EDGE RF Power Capability 1** and **EDGE RF Power Capability 2** fields contain the following coding of the 8-PSK modulation power class (see 3GPP TS 45.005 [33]):

Bits	2	1	
	0	0	Reserved
	0	1	Power class E1
	1	0	Power class E2
	1	1	Power class E3

Table 10.5.1.7/3GPP TS 24.008 (continued): *MS Classmark 3* information element

GSM 400 Bands Supported (2 bit field)
See the semantic rule for the sending of this field.
Bits

2	1	
0	1	GSM 480 supported, GSM 450 not supported
1	0	GSM 450 supported, GSM 480 not supported
1	1	GSM 450 supported, GSM 480 supported

GSM 400 Associated Radio Capability (4 bit field)
If either GSM 450 or GSM 480 or both is supported, the GSM 400 Associated Radio Capability field indicates the radio capability for GSM 450 and/or GSM 480.

The radio capability contains the binary coding of the power class associated with the band indicated in GSM 400 Bands Supported bits (see 3GPP TS 45.005 [33]).

NOTE: The coding of the power class for GSM 450 and GSM 480 in GSM 400 Associated Radio Capability is different to that used in the Mobile Station Classmark 1 and Mobile Station Classmark 2 information elements.

GSM 850 Associated Radio Capability (4 bit field)
See the semantic rule for the sending of this field.
This field indicates whether GSM 850 band is supported and its associated radio capability.

The radio capability contains the binary coding of the power class associated with the GSM 850 band (see 3GPP TS 45.005 [33]).

Note: the coding of the power class for GSM 850 in GSM 850 Associated Radio Capability is different to that used in the Mobile Station Classmark 1 and Mobile Station Classmark 2 information elements.

PCS 1900 Associated Radio Capability (4 bit field)
See the semantic rule for the sending of this field.
This field indicates whether PCS 1900 band is supported and its associated radio capability.

The radio capability contains the binary coding of the power class associated with the PCS 1900 band (see 3GPP TS 45.005 [33]).

Note: the coding of the power class for PCS 1900 in PCS 1900 Associated Radio Capability is different to that used in the Mobile Station Classmark 1 and Mobile Station Classmark 2 information elements.

Table 10.5.1.7/3GPP TS 24.008 (continued): *MS Classmark 3* information element

UMTS FDD Radio Access Technology Capability (1 bit field)
0 UMTS FDD not supported
1 UMTS FDD supported

UMTS 3.84 Mcps TDD Radio Access Technology Capability (1 bit field)
0 UMTS 3.84 Mcps TDD not supported
1 UMTS 3.84 Mcps TDD supported

CDMA 2000 Radio Access Technology Capability (1 bit field)
0 CDMA2000 not supported
1 CDMA2000 supported

DTM GPRS Multi Slot Class (2 bit field)
This field indicates the GPRS DTM multislot capabilities of the MS. It is coded as follows:
Bit
2 1
0 0 Multislot class 1 supported
0 1 Multislot class 5 supported
1 0 Multislot class 9 supported
1 1 Reserved for future extension. If received, the network shall interpret this as '00'

MAC Mode Support (1 bit field)
This field indicates whether the MS supports Dynamic and Fixed Allocation or only supports Exclusive Allocation. It is coded as follows:

0 Dynamic and Fixed Allocation not supported
1 Dynamic and Fixed allocation supported

EGPRS DTM Multi Slot Class (2 bit field)
This field indicates the EGPRS DTM multislot capabilities of the MS. This field shall be included only if the mobile station supports EGPRS DTM. This field is coded as the DTM GPRS Multi Slot Class field.

Single Band Support
This field shall be sent if the mobile station supports UMTS and one and only one GSM band with the exception of R-GSM; this field shall not be sent otherwise

GSM Band (4 bit field)
Bits
4 3 2 1
0 0 0 0 E-GSM is supported
0 0 0 1 P-GSM is supported
0 0 1 0 DCS 1800 is supported
0 0 1 1 GSM 450 is supported
0 1 0 0 GSM 480 is supported
0 1 0 1 GSM 850 is supported
0 1 1 0 PCS 1900 is supported
0 1 1 1 GSM 700 is supported
All other values are reserved for future use.

NOTE: When this field is received, the associated RF power capability is found in Classmark 1 or 2.

GSM 700 Associated Radio Capability (4 bit field)

See the semantic rule for the sending of this field.
This field indicates whether GSM 700 band is supported and its associated radio capability.

The radio capability contains the binary coding of the power class associated with the GSM 700 band (see 3GPP TS 45.005 [33]).

NOTE: The coding of the power class for GSM 700 in GSM 700 Associated Radio Capability is different to that used in the Mobile Station Classmark 1 and Mobile Station Classmark 2 information elements.

UMTS 1.28 Mcps TDD Radio Access Technology Capability (1 bit field)
0 UMTS 1.28 Mcps TDD not supported

1 UMTS 1.28 Mcps TDD supported

GERAN Feature Package 1 (1 bit field)
This field indicates whether the MS supports the GERAN Feature Package 1 (see 3GPP TS 44.060). It is coded as follows:

0 GERAN feature package 1 not supported.
1 GERAN feature package 1 supported.

Extended GPRS DTM Multi Slot Class (2 bit field)
This field indicates the extended GPRS DTM multislot capabilities of the MS and shall be interpreted in conjunction with the GPRS DTM Multi Slot Class field. It is coded as follows, where 'DGMSC' denotes the DTM GPRS Multi Slot Class field:

DGMSC Bit	2 1	**Bit 2 1**	
	0 0	**0 0**	Multislot class 2 supported
	0 0	**0 1**	Multislot class 3 supported
	0 0	**1 0**	Multislot class 4 supported
	0 0	**1 1**	Multislot class 8 supported
	0 1	**0 0**	Multislot class 5 supported
	0 1	**0 1**	Multislot class 6 supported
	0 1	**1 0**	Multislot class 7 supported
	0 1	**1 1**	Spare. If received, the network shall interpret it as '(01) **00**'.
	1 0	**0 0**	Multislot class 9 supported
	1 0	**0 1**	Multislot class 10 supported
	1 0	**1 0**	Multislot class 11 supported
	1 0	**1 1**	Multislot class 12 supported

The presence of this field indicates that the MS supports combined fullrate and halfrate GPRS channels in the downlink.When this field is not present, the MS supports the multislot class indicated by the *DTM GPRS Multi Slot Class* field.

Extended DTM EGPRS Multi Slot Class (2 bit field)
This field is not considered when the EGPRS DTM Multi Slot Class field is not included. This field indicates the extended EGPRS DTM multislot capabilities of the MS and shall be interpreted in conjunction with the EGPRS DTM Multi Slot Class field. This field is coded as the Extended DTM GPRS Multi Slot Class field. The presence of this field indicates that the MS supports combined fullrate and halfrate GPRS channels in the downlink. When this field is not present, the MS supports the multislot class indicated by the *DTM GPRS Multi Slot Class* field.

GERAN Iu Mode Capability (1 bit field)
Bit
0 GERAN Iu mode not supported
1 GERAN Iu mode supported

10.5.3.5a Network Name

The purpose of this information element is to pass a text string to the mobile station.

The *Network Name* information element is coded as shown in figure 10.5.80/3GPP TS 24.008 and table 10.5.94/3GPP TS 24.008.

The *Network Name* is a type 4 information element with a minimum length of 3 octets. No upper length limit is specified except for that given by the maximum number of octets in a L3 message (see 3GPP TS 44.006 [19]).

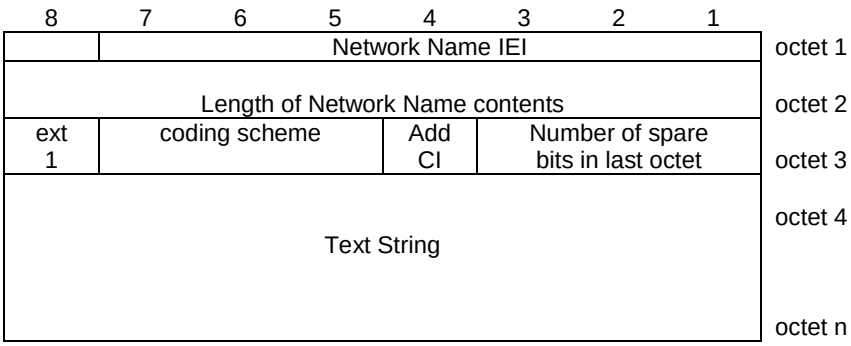

Figure 10.5.80/3GPP TS 24.008 *Network Name* information element

Table 10.5.94/3GPP TS 24.008 *Network Name* information element

Number of spare bits in last octet (octet 3, bits 1 to 3)

2	**1**		
0	0	1	bit 8 is spare and set to "0" in octet n
0	1	0	bits 7 and 8 are spare and set to "0" in octet n
0	1	1	bits 6 to 8(inclusive) are spare and set to "0" in octet n
1	0	0	bits 5 to 8(inclusive) are spare and set to "0" in octet n
1	0	1	bits 4 to 8(inclusive) are spare and set to "0" in octet n
1	1	0	bits 3 to 8(inclusive) are spare and set to "0" in octet n
1	1	1	bits 2 to 8(inclusive) are spare and set to "0" in octet n
0	0	0	this field carries no information about the number of spare bits in octet n

Add CI (octet 3, bit 4)

0	The MS should not add the letters for the Country's Initials to the text string
1	The MS should add the letters for the Country's Initials and a separator (e.g. a space) to the text string

Coding Scheme (octet 3, bits 5-7)

0	0	0	Cell Broadcast data coding scheme, GSM default alphabet, language unspecified, defined in 3GPP TS 23.038 [8b]~~03.38~~
0	0	1	UCS2 (16 bit) [72]
0	1	0	
to			reserved
1	1	1	

Text String (octet 4 to octet n, inclusive)
Encoded according to the Coding Scheme defined by octet 3, bits 5-7

10.5.4.5 Bearer capability

The purpose of the bearer capability information element is to describe a bearer service. The use of the bearer capability information element in relation to compatibility checking is described in annex B.

The bearer capability information element is coded as shown in figure 10.5.88/3GPP TS 24.008 and tables 10.5.102/3GPP TS 24.008 to 10.5.115/3GPP TS 24.008.

The bearer capability is a type 4 information element with a minimum length of 3 octets and a maximum length of 16 octets.

8	7	6	5	4	3	2	1	
	Bearer capability IEI							octet 1
Length of the bearer capability contents								octet 2
0/1 ext	radio channel requirement		co-ding std	trans fer mode	information transfer capability			octet 3
0/1 ext	0 co-ding	CTM	0 spar e	speech version indication				octet 3a *
0/1 ext	0 co-ding	0 spare	0 spare	Speech version Indication				octet 3b etc*
1 ext	comp -ress.	structure		dupl. mode	confi gur.	NIRR	esta-bli.	octet 4*
0/1 ext	0 access id.	0	rate adaption		signalling access protocol			octet 5*
0/1 ext	Other ITC		Other rate adaption		0	0 Spare	0	octet 5a*
1 ext	Hdr/ noHdr	Multi frame	Mode	LLI	Assig nor/e	Inb. neg	0 Spare	octet 5b*
0/1 ext	0 layer 1 id.	1	User information layer 1 protocol				sync/ async	octet 6*
0/1 ext	numb. stop bits	nego-tia-tion	numb. data bits	user rate				octet 6a*
0/1 ext	intermed. rate		NIC on TX	NIC on RX	Parity			octet 6b*
0/1 ext	connection element		modem type					octet 6c*
0/1 ext	Other modem type		Fixed network user rate					octet 6d*
0/1 ext	Acceptable channel codings				Maximum number of traffic channels			octet 6e*
0/1 ext	UIMI			Wanted air interface user rate				octet 6f*
1 ext	Acceptable channel codings extended			Asymmetry Indication		0 Spare	0	octet 6g*
1 ext	1 layer 2 id.	0	User information layer 2 protocol					octet 7*

Figure 10.5.88/3GPP TS 24.008 Bearer capability information element

NOTE 1: The coding of the octets of the bearer capability information element is not conforming to ITU Q.931.

NOTE 2: An MS shall encode the Bearer Capability infomation element according to GSM call control requirements also if it is requesting for a UMTS service.

NOTE 3: For UTRAN access the following parameter is irrelevant, because multiple traffic channels (multislot) are not deployed [3GPP TS 23.034]. The parameter shall, however, be stored in MSC, and forwarded at handover:
- UIMI, User initiated modification indication (octet 6f, bits 5-7)

NOTE 4: The following parameters are relevant in UMTS for non transparent data calls for deciding which RLP version to negotiate in order to avoid renegotiation of RLP version in case of inter-system handover, see 3GPP TS 24.022 [9]. They are otherwise irrelevant for specifying the UTRAN radio access bearer:
-

~~NOTE 5:~~ Maximum number of traffic channels (octet 6e, bits 1-3)
- Acceptable Channel coding(s) (octet 6e, bits 4, 5 and 7)
- Acceptable Channel Codings extended (octet 6g, bits 5-7).

NOTE 5~~6~~: A mobile station not supporting GSM shall set the following parameters to the value "0":
- Maximum number of traffic channels (octet 6e, bits 1-3)
- Acceptable Channel coding(s) (octet 6e, bits 4, 5 and 7)
- UIMI, User initiated modification indication (octet 6f, bits 5-7)
- Acceptable Channel Codings extended (octet 6g, bits 5-7).

10.5.4.15 Facility

The purpose of the facility information element is to transport supplementary service related information. Within the scope of 3GPP TS 24.008 the content of the Facility information field is an array of octets. The usage of this transportation mechanism is defined in 3GPP TS 24.080 [24].

The facility information element is coded as shown in figure 10.5.101/3GPP TS 24.008.

The facility is a type 4 information element with a minimum length of 2 octets. No upper length limit is specified except for that given by the maximum number of octets in a L3 message (see 3GPP TS 44.006 [19]).

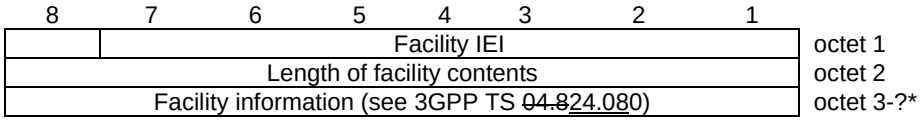

Figure 10.5.101/3GPP TS 24.008

10.5.4.24 SS Version Indicator

The purpose of the SS version indicator information element is to aid the decoding of the Facility information element as described in 3GPP TS 24.010. Within the scope of 3GPP TS 24.008 the contents of the SS Version information field is an array of one or more octets. The usage of the SS version information field is defined in 3GPP TS 24.080.

The SS version indicator information element is coded as shown in figure 10.5.113/3GPP TS 24.008.

The SS version indicator is a type 4 information element with a minimum length of 2 octets. No upper length limit is specified except for that given by the maximum number of octets in a L3 message (see 3GPP TS 44.006 [19]).

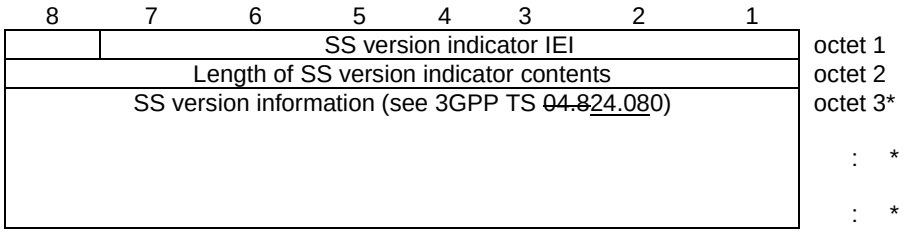

Figure 10.5.113/3GPP TS 24.008

NOTE: Usually, this information element has only one octet of content.

10.5.4.26 Alerting Pattern (NIA)

The purpose of the Alerting Pattern information element is to allow the network to convey information related to the alert to be used by the MS (see 3GPP TS 22.101 [8]02.07).

The Alerting Pattern information element is coded as shown in figure 10.5.115/3GPP TS 24.008 and table 10.5.132/3GPP TS 24.008.

The Alerting Pattern IE is a type 4 information element with 3 octet length.

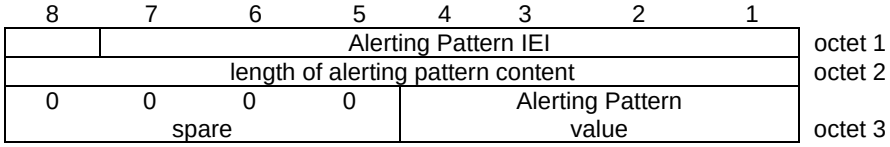

Figure 10.5.115/3GPP TS 24.008 Alerting Pattern information element

Table 10.5.132/3GPP TS 24.008: Alerting Pattern information element

Alerting Pattern value (octet 3) Bits **4 3 2 1**	
0 0 0 0	alerting pattern 1
0 0 0 1	alerting pattern 2
0 0 1 0	alerting pattern 3
0 1 0 0	alerting pattern 5
0 1 0 1	alerting pattern 6
0 1 1 0	alerting pattern 7
0 1 1 1	alerting pattern 8
1 0 0 0	alerting pattern 9
all other values are reserved	

Alerting pattern 1, 2 and 3 indicate alerting levels 0, 1 and 2.

Alerting pattern 5 to 9 indicate alerting categories 1 to 5

10.5.5.12 MS network capability

The purpose of the *MS network capability* information element is to provide the network with information concerning aspects of the mobile station related to GPRS. The contents might affect the manner in which the network handles the

operation of the mobile station. The *MS network capability* information indicates general mobile station characteristics and it shall therefore, except for fields explicitly indicated, be independent of the frequency band of the channel it is sent on.

The *MS network capability* is a type 4 information element with a maximum of 10 octets length.

The value part of a *MS network capability*information element is coded as shown in figure 10.5.128/3GPP TS 24.008 and table 10.5.145/3GPP TS 24.008.

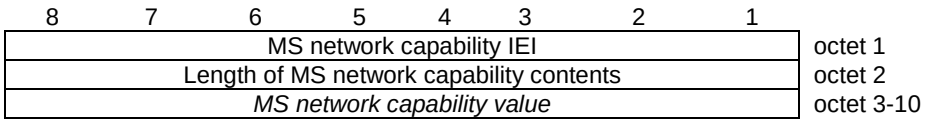

Figure 10.5.128/3GPP TS 24.008 MS network capability information element

Table 10.5.145/3GPP TS 24.008 *MS network capability* information element

<MS network capability value part> ::=

<**GEA1 bits**>
<**SM capabilities via dedicated channels**: bit>
<**SM capabilities via GPRS channels**: bit>
<**UCS2 support**: bit>
<**SS Screening Indicator**: bit string(2)>
<SoLSA Capability : bit>
<Revision level indicator: bit>
<PFC feature mode: bit>
<Extended GEA bits>
< LCS VA capability: bit >
<Spare bits>;

<**GEA1 bits**> ::= < **GEA/1** :bit>;

<Extended GEA bits> ::= <GEA/2:bit><GEA/3:bit>< GEA/4:bit >< GEA/5:bit >< GEA/6:bit ><GEA/7:bit>;

<**Spare bits**> ::= null | {<spare bit> < **Spare bits** >};

SS Screening Indicator
0 0 defined in 3GPP TS 24.080

0 1 defined in 3GPP TS 24.080
1 0 defined in 3GPP TS 24.080
1 1 defined in 3GPP TS 24.080

SM capabilities via dedicated channels
0 Mobile station does not support mobile terminated point to point SMS via dedicated signalling channels
1 Mobile station supports mobile terminated point to point SMS via dedicated signalling channels

SM capabilities via GPRS channels
0 Mobile station does not support mobile terminated point to point SMS via GPRS packet data channels
1 Mobile station supports mobile terminated point to point SMS via GPRS packet data channels

UCS2 support
This information field indicates the likely treatment by the mobile station of UCS2 encoded character strings.
0 the ME has a preference for the default alphabet (defined in 3GPP TS 23.038 [8b]~~03.38~~) over UCS2.
1 the ME has no preference between the use of the default alphabet and the use of UCS2.

GPRS Encryption Algorithm GEA/1
0 encryption algorithm **GEA/1**not available
1 encryption algorithm **GEA/1** available

SoLSA Capability
0 The ME does not support SoLSA.
1 The ME supports SoLSA.

Revision level indicator
0 used by a mobile station not supporting R99 or later versions of the protocol
1 used by a mobile station supporting R99 or later versions of the protocol

PFC feature mode
0 Mobile station does not support BSS packet flow procedures
1 Mobile station does support BSS packet flow procedures

GEA/2
0 encryption algorithm GEA/2 not available
1 encryption algorithm GEA/2 available

GEA/3
0 encryption algorithm GEA/3 not available
1 encryption algorithm GEA/3 available

GEA/4
0 encryption algorithm GEA/4 not available
1 encryption algorithm GEA/4 available

GEA/5
0 encryption algorithm GEA/5 not available
1 encryption algorithm GEA/5 available

GEA/6
0 encryption algorithm GEA/6 not available
1 encryption algorithm GEA/6 available

GEA/7
0 encryption algorithm GEA/7 not available
1 encryption algorithm GEA/7 available

LCS VA capability (LCS value added location request notification capability)
0 LCS value added location request notification capability not supported
1 LCS value added location request notification capability supported

10.5.5.12a MS Radio Access capability

The purpose of the *MS RA capability* information element is to provide the radio part of the network with information concerning radio aspects of the mobile station. The contents might affect the manner in which the network handles the operation of the mobile station.

The *MS RA capability* is a type 4 information element, with a maximum length of 52 octets.

The value part of a *MS RA capability* information element is coded a shown table 10.5.146/3GPP TS 24.008.

For the indication of the Access Technology Types the following conditions shall apply:

- Among the three Access Type Technologies GSM 900-P, GSM 900-E and GSM 900-R only one shall be present.
- Due to shared radio frequency channel numbers between GSM 1800 and GSM 1900, the mobile station should provide the relevant radio access capability for either GSM 1800 band OR GSM 1900 band, not both.
- The MS shall indicate its supported Access Technology Types during a single MM procedure.
- If the alternative coding by using the Additional access technologies struct is chosen by the mobile station, the mobile station shall indicate its radio access capability for the serving BCCH frequency band in the first included Access capabilities struct.
- The first Access Technology Type shall not be set to "1111".

For error handling the following shall apply:

– If a received Access Technology Type is unknown to the receiver, it shall ignore all the corresponding fields.

– If within a known Access Technology Type a receiver recognizes an unknown field it shall ignore it.

– For more details about error handling of MS radio access capability see 3GPP TS 48.018 [86].

Table 10.5.146/3GPP TS 24.008: *Mobile Station Radio Access Capability* Information Element

< MS Radio Access capability IE > ::=
<**MS Radio Access capability IEI** : 00100100 >
<**Length of MS RA capability**: <octet>> -- *length in octets of MS RA capability value part and spare bits*
<**MS RA capability value part** : < MS RA capability value part struct >>
<spare bits>**; -- *may be used for future enhancements*

<MS RA capability value part struct >::= --*recursive structure allows any number of Access technologies*
{ { < **Access Technology Type**: bit (4) > exclude 1111
< **Access capabilities** : <Access capabilities struct> > }

| { < **Access Technology Type**: bit (4) == 1111 > -- *structure adding Access technologies with same capabilities*
< **Length** : bit (7) > -- *length in bits of list of Additional access technologies and spare bits*
{ 1 < **Additional access technologies**: < Additional access technologies struct > > } ** 0
<spare bits>** } }

{ 0 | 1 <MS RA capability value part struct> } ;

< Additional access technologies struct > ::=
< **Access Technology Type** : bit (4) >
< **GMSK Power Class** : bit (3) >
< **8PSK Power Class** : bit (2) > ;

< Access capabilities struct > ::=
< **Length** : bit (7) > -- length in bits of Content and spare bits
<Access capabilities : <Content>>
<spare bits>** ; -- expands to the indicated length
-- may be used for future enhancements

< Content > ::=
< **RF Power Capability** : bit (3) >
{ 0 | 1 <**A5 bits** : <A5 bits> > } -- *zero means that the same values apply for parameters as in the immediately preceding Access capabilities field within this IE*
< **ES IND** : bit >
< **PS** : bit >
< **VGCS** : bit >
< **VBS** : bit >
{ 0 | 1 < **Multislot capability** : Multislot capability struct > } -- *zero means that the same values for multislot parameters as given in an earlier Access capabilities field within this IE apply also here*
-- Additions in release 99
{ 0 | 1 < **8PSK Power Capability** : bit(2) >} -- *'1' also means 8PSK modulation capability in uplink.*
< **COMPACT Interference Measurement Capability : bit >**
< **Revision Level Indicator** : bit >
< **UMTS FDD Radio Access Technology Capability** : bit > -- *3G RAT*
< **UMTS 3.84 Mcps TDD Radio Access Technology Capability** : bit > -- *3G RAT*
< **CDMA 2000 Radio Access Technology Capability** : bit > -- *3G RAT*
-- Additions in release 4
< **UMTS 1.28 Mcps TDD Radio Access Technology Capability**: bit > -- *3G RAT*
< **GERAN Feature Package 1** : bit >
{ 0 | 1 < **Extended DTM GPRS Multi Slot Class** : bit(2) >
< **Extended DTM EGPRS Multi Slot Class** : bit(2) > }
-- Additions in release 5
< **GERAN Iu Mode Capability** : bit >;
-- error: struct too short, assume features do not exist
-- error: struct too long, ignore data and jump to next Access technology

Table 10.5.146/3GPP TS 24.008 (continued): *Mobile Station Radio Access Capability* IE

< Multislot capability struct > ::=
{ 0 | 1 < **HSCSD multislot class** : bit (5) > }
{ 0 | 1 < **GPRS multislot class** : bit (5) > < **GPRS Extended Dynamic Allocation Capability** : bit > }
{ 0 | 1 < **SMS_VALUE** : bit (4) > < **SM_VALUE** : bit (4) > }
-- *Additions in release 99*
{ 0 | 1 < **ECSD multislot class** : bit (5) > }
{ 0 | 1 < **EGPRS multislot class** : bit (5) > < **EGPRS Extended Dynamic Allocation Capability** : bit > }
{0 | 1 < **DTM GPRS Multi Slot Class**: bit(2)>
<MAC Mode Support : bit>
{0 | 1 <**EGPRS DTM Multi Slot Class** : bit(2)> } } ;
-- error: struct too short, assume features do not exist

<A5 bits> ::= < A5/1 : bit> <A5/2 : bit> <A5/3 : bit> <A5/4 : bit> <A5/5 : bit> <A5/6 : bit> <A5/7 : bit>; -- bits for circuit mode ciphering algorithms. These fields are not used by the network and may be excluded by the MS.

Access Technology Type
This field indicates the access technology type to be associated with the following access capabilities.

Bits
4 3 2 1
0 0 0 0 GSM P
0 0 0 1 GSM E *--note that GSM E covers GSM P*
0 0 1 0 GSM R *--note that GSM R covers GSM E and GSM P*
0 0 1 1 GSM 1800
0 1 0 0 GSM 1900
0 1 0 1 GSM 450
0 1 1 0 GSM 480
0 1 1 1 GSM 850
1 0 0 0 GSM 700
1 1 1 1 Indicates the presence of a list of Additional access technologies
All other values are treated as unknown by the receiver.

RF Power Capability, GMSK Power Class (3 bit field)
This field contains the binary coding of the power class used for GMSK associated with the indicated Access Technology Type (see 3GPP TS 45.005).

8PSK Power Capability (2 bit field)
If 8-PSK modulation is supported for uplink, this field indicates the radio capability for 8-PSK modulation. The following coding is used (see 3GPP TS 45.005 [33]):
Bits 2 1
0 0 Reserved
0 1 Power class E1
1 0 Power class E2
1 1 Power class E3

8PSK Power Class (2 bit field)
This field indicates the radio capability for 8-PSK modulation. The following coding is used (see 3GPP TS 45.005~~05.05~~):
Bits 2 1
0 0 8PSK modulation not supported for uplink
0 1 Power class E1
1 0 Power class E2
1 1 Power class E3

Additional access technologies struct
This structure contains the GMSK Power Class and 8PSK Power Class for an additional Access Technology. All other capabilities for this indicated Access Technology are the same as the capabilities indicated by the preceding Access capabilities struct.

A5/1
0 encryption algorithm A5/1 not available
1 encryption algorithm A5/1 available
A5/2
0 encryption algorithm A5/2 not available
1 encryption algorithm A5/2 available

A5/3
0 encryption algorithm A5/3 not available
1 encryption algorithm A5/3 available
A5/4
0 encryption algorithm A5/4 not available
1 encryption algorithm A5/4 available
A5/5
0 encryption algorithm A5/5 not available
1 encryption algorithm A5/5 available
A5/6
0 encryption algorithm A5/6 not available
1 encryption algorithm A5/6 available
A5/7
0 encryption algorithm A5/7 not available
1 encryption algorithm A5/7 available

ES IND – (Controlled early Classmark Sending)
0 "controlled early Classmark Sending" option is not implemented
1 "controlled early Classmark Sending" option is implemented

Table 10.5.146/3GPP TS 24.008 (concluded): *Mobile Station Radio Access Capability* Information Element

PS – (Pseudo Synchronisation)
0 PS capability not present
1 PS capability present

VGCS – (Voice Group Call Service)
0 no VGCS capability or no notifications wanted
1 VGCS capability and notifications wanted.

VBS – (Voice Broadcast Service)
0 no VBS capability or no notifications wanted
1 VBS capability and notifications wanted

HSCSD Multi Slot Class
The Multi Slot Class field is coded as the binary representation of the multislot class defined in 3GPP TS 45.002 [32]. This field is not used by the network and may be excluded by the MS.
Range 1 to 18, all other values are reserved.

GPRS Multi Slot Class
The GPRS Multi Slot Class field is coded as the binary representation of the multislot class defined in 3GPP TS 45.002 [32].

-- Additions in release 99

ECSD Multi Slot Class
The presence of this field indicates ECSD capability. Whether the MS is capable of 8-PSK modulation in uplink is indicated by the presence of 8-PSK Power Capability field. The Multi Slot Class field is coded as the binary representation of the multislot class defined in 3GPP TS 45.002 [32]. This field is not used by the network and may be excluded by the MS.
Range 1 to 18, all other values are reserved.

EGPRS Multi Slot Class
The presence of this field indicates EGPRS capability. Whether the MS is capable of 8-PSK modulation in uplink is indicated by the presence of 8-PSK Power Capability field. The EGPRS Multi Slot Class field is coded as the binary representation of the multislot class defined in 3GPP TS 45.002 [32].

GPRS Extended Dynamic Allocation Capability
0 Extended Dynamic Allocation Capability for GPRS is not implemented
1 Extended Dynamic Allocation Capability for GPRS is implemented
EGPRS Extended Dynamic Allocation Capability
0 Extended Dynamic Allocation Capability for EGPRS is not implemented
1 Extended Dynamic Allocation Capability for EGPRS is implemented

SMS_VALUE (Switch-Measure-Switch) (4 bit field)
The SMS field indicates the time needed for the mobile station to switch from one radio channel to another, perform a neighbor cell power measurement, and the switch from that radio channel to another radio channel. This field is not used by the network and may be excluded by the MS.
Bits
4 3 2 1
0 0 0 0 1/4 timeslot (~144 microseconds)
0 0 0 1 2/4 timeslot (~288 microseconds)
0 0 1 0 3/4 timeslot (~433 microseconds)
. . .
1 1 1 1 16/4 timeslot (~2307 microseconds)
(SM_VALUE) Switch-Measure (4 bit field)
The SM field indicates the time needed for the mobile station to switch from one radio channel to another and perform a neighbour cell power measurement. This field is not used by the network and may be excluded by the MS.
Bits
4 3 2 1
0 0 0 0 1/4 timeslot (~144 microseconds)
0 0 0 1 2/4 timeslot (~288 microseconds)
0 0 1 0 3/4 timeslot (~433 microseconds)
. . .
1 1 1 1 16/4 timeslot (~2307 microseconds)

DTM GPRS Multi Slot Class (2 bit field)
This field indicates the GPRS DTM multislot capabilities of the MS. It is coded as follows:
Bits
2 1
0 0 Multislot class 1 supported
0 1 Multislot class 5 supported
1 0 Multislot class 9 supported
1 1 Reserved for future extension. If received, the network shall interpret this as '00'

MAC Mode Support (1 bit field)
This field indicates whether the MS supports Dynamic and Fixed Allocation or only supports Exclusive Allocation
Bit
0 Dynamic and Fixed Allocation not supported
1 Dynamic and Fixed allocation supported

EGPRS DTM Multi Slot Class (2 bit field)
This field indicates the EGPRS DTM multislot capabilities of the MS. This field shall be included only if the mobile station supports EGPRS DTM. This field is coded as the DTM GPRS multislot Class field.

COMPACT Interference Measurement Capability (1 bit field)
0 COMPACT Interference Measurement Capability is not implemented
1 COMPACT Interference Measurement Capability is implemented

Revision Level Indicator (1 bit field)
Bit
0 The ME is Release '98 or older
1 The ME is Release '99 onwards

UMTS FDD Radio Access Technology Capability (1 bit field)
Bit
0 UMTS FDD not supported
1 UMTS FDD supported

UMTS 3.84 Mcps TDD Radio Access Technology Capability (1 bit field)
Bit
0 UMTS 3.84 Mcps TDD not supported
1 UMTS 3.84 Mcps TDD supported

CDMA 2000 Radio Access Technology Capability (1 bit field)
Bit
0 CDMA 2000 not supported
1 CDMA 2000 supported

UMTS 1.28 Mcps TDD Radio Access Technology Capability (1 bit field)
Bit
0 UMTS 1.28 Mcps TDD not supported
1 UMTS 1.28 Mcps TDD supported

GERAN Feature Package 1 (1 bit field)
This field indicates whether the MS supports the GERAN Feature Package 1 (see 3GPP TS 44.060). It is coded as follows:

0 GERAN feature package 1 not supported.
1 GERAN feature package 1 supported.

Extended GPRS DTM Multi Slot Class (2 bit field)
This field indicates the extended GPRS DTM capabilities of the MS and shall be interpreted in conjunction with the GPRS DTM Multi Slot Class field. It is coded as follows, where 'DGMSC' denotes the DTM GPRS multislot class field:

DGMSC Bit	2 1	**Bit 2 1**	
	0 0	**0 0**	Multislot class 2 supported
	0 0	**0 1**	Multislot class 3 supported
	0 0	**1 0**	Multislot class 4 supported
	0 0	**1 1**	Multislot class 8 supported
	0 1	**0 0**	Multislot class 5 supported

0 1	**0 1**	Multislot class 6 supported
0 1	**1 0**	Multislot class 7 supported
0 1	**1 1**	Spare. If received, the network shall interpret it as '01 **00**'.
1 0	**0 0**	Multislot class 9 supported
1 0	**0 1**	Multislot class 10 supported
1 0	**1 0**	Multislot class 11 supported
1 0	**1 1**	Multislot class 12 supported

The presence of this field indicates that the MS supports combined fullrate and halfrate GPRS channels in the downlink. When this field is not present, the MS supports the multislot class indicated by the *DTM GPRS Multi Slot Class* field.

Extended EGPRS DTM Multislot Class (2 bit field)
This field is not considered when the EGPRS DTM Multislot Class field is not included. This field indicates the extended EGPRS DTM multislot capabilities of the MS and shall be interpreted in conjunction with the EGPRS DTM Multislot Class field. This field is coded as the Extended DTM GPRS Multislot Class field. The presence of this field indicates that the MS supports combined fullrate and halfrate GPRS channels in the downlink. When this field is not present, the MS supports the multislot class indicated by the *DTM GPRS Multi Slot Class* field.

GERAN Iu Mode Capability (1 bit field)
Bit
0 GERAN Iu mode not supported
1 GERAN Iu mode supported

11.3 Timers of circuit-switched call control

Table 11.3/3GPP TS 24.008: Call control timers - MS side

TIM NUM.	TIM VAL	STATE OF CALL	CAUSE OF START	NORMAL STOP	AT FIRST EXPIRY	AT SECOND EXPIRY
T303	30s	Call initiated	CM SER RQ sent	CALL PROC, or REL COMP received	Clear the call	Timer is not restarted
T305	30s	Disconnect Request	DISC sent	REL or DISC received	REL sent.	Timer is not restarted
T308	30s	Release request	REL sent	REL COMP or REL received	Retrans. RELEASE restart T308	Call ref. release
T310 Note 1	30s	Outgoing call Proceeding	CALL PROC received	ALERT,CONN, DISC or PROG rec.	Send DISC	Timer is not restarted
T313	30s	Connect Request	CONN sent	CONNect ACKnowledge received	Send DISC	Timer is not restarted
T323	30s	Modify Request	MOD sent	MOD COMP or MOD REJ received	Clear the call	Timer is not restarted
T332	30s	Wait for network info	START_CC sent	CC-EST. received	Clear the call	Timer is not restarted
T335	30s	CC-Est. Confirmed	CC-EST CONF.sent	RECALL received	Clear the call	Timer is not restarted
T336	10s		START DTMF sent	START DTMF ACK or START DTMF REJECT received	The MS considers the DTMF Procedure (for the digit) to be terminated	Timer is not restarted
T337	10s		STOP DTMF sent	STOP DTMF ACK received	The MS considers the DTMF procedure (for the current digit) to be terminated	Timer is not restarted

NOTE 1: T310 is not started if progress indicator #1, #2, or #64 has been delivered in the CALL PROCEEDING message or in a previous PROGRESS message.

Table 11.4/3GPP TS 24.008: Call control timers - network side

TIM NUM.	DFT TIM VAL	STATE OF CALL	CAUSE FOR START	NORMAL STOP	AT FIRST EXPIRY	AT SECOND EXPIRY
T301 Note 1	Min180s	Call received	ALERT received	CONN received	Clear the call	Timer is not restarted
T303	Note 2	Call present	SETUP sent	CALL CONF or REL COMP received	Clear the call	Timer is not restarted
T305	30s	Disconnect Indication	DISC without progress indic. #8 sent or CCBS Possible	REL or DISC received	Network sends RELEASE	Timer is not restarted
T306	30s	Disconnect Indication	DISC with progress indic. #8 sent but no CCBS possible	REL or DISC received	Stop the tone/ announc. Send REL	Timer is not restarted
T308	Note 2	Release request	REL sent	REL COMP or REL received	Retrans. RELEASE restart T308	Release call reference
T310	Note 2	Incoming call proceeding	CALL CONF received	ALERT, CONN or DISC received	Clear the call	Timer is not restarted
T313	Note 2	Connect Indication	CON sent	CON ACK received	Clear the call	Timer is not restarted
T323	30s	Modify request	MOD sent	MOD COMP or MOD REJ received	Clear the call	Timer is not restarted
T331	Note 2	CC Connec. Pending	CM-SERV PROMPT sent	START CC received	Clear the call	Timer is not restarted
T333	Note 2	CC-Est. Present	START CC received	CC-EST.CONF or REL COMP received	Clear the call	Timer is not restarted
T334 Note 3	Min 15s	CC-Est. Confirmed	RECALL sent	SETUP received	Clear the call	Timer is not restarted
T338	Note 2	Disconnect indication	DISC with CCBS possible	REL or DISC received	stop any tone/ announc. Send REL	Timer is not restarted

NOTE 1: The network may already have applied an internal alerting supervision function; e.g. incorporated within call control. If such a function is known to be operating on the call, then timer T301 is not used.

NOTE 2: These time values are set by the network operator.

NOTE 3: When applied to the supplementary service CCBS, the timer T334 can either represent the recall timer T4 or the notification timer T10 (see 3GPP TS 23.093~~03.93~~). Thus the timer T334 can take two different values. 3GPP TS 23.093~~03.93~~ defines the range of these values.

C.2 Principles

C.2.1 Definition of types of information

There are three different types of information that the calling PLMN user may specify during call setup to identify low layer capabilities needed in the network and in the destination terminal:

a) type I information is information about the calling terminal which is only used at the destination end to allow a decision regarding terminal compatibility. An example would be the user information layer 3 protocol. Type I information is encoded in octets 5 to 7 of the low layer compatibility information element;

b) type II information is only used by the network (PLMN) to which the calling user is connected for selection of PLMN specific network resources, e.g. channel type or specific functionality within the interworking function (IWF, see 3GPP TS 29.007~~09.07~~). This type of information is always present. An example is the connection element. Type II information is coded in:

   i) octet 3 of the bearer capability information element when the information transfer capability required by the calling user is speech ;

   ii) octets 3, 4, 5, and optionally octet 7 of the bearer capability information element when the information transfer capability required by the calling user is not speech;

c) type III information is required for selection of a basic service from the choice of basic services offered by the network and together with type II information for selection of an appropriate interworking function (IWF, see 3GPP TS 29.007 [38]), as well as for terminal compatibility checking at the destination terminal. An example is the information transfer capability. Type III information is always present and is encoded in:

   i) octet 3 of the bearer capability information element when the information transfer capability required by the calling user is speech ;

   ii) octets 3, 5, 6, 6a, 6b and 6c of the bearer capability information element when the information transfer capability required by the calling user is not speech;