3GPP TSG_CN#7 **NP-000101**
ETSI SMG3 Plenary Meeting #7,
Madrid, Spain
13th – 15th March 2000

Agenda item: **5.1.3**

Source: **TSG_N WG1**

Title: **CRs to 3G Work Item TEI**

Introduction:

This document contains **"8"** CRs on **Work Item TEI,** that have been agreed by **TSG_N WG1,** and are forwarded to **TSG_N Plenary** meeting #7 for approval.

Tdoc	Spec	CR	Rev	CAT	Rel.	Old Ver	New Ver	Subject
N1-000357	24.011	CR005	-	D	R99	3.1.0	3.2.0	Cleaning up the References
N1-000400	24.008	CR170		F	R99	3.2.1	3.3.0	Correction of static conditions of BC IE contents
N1-000373	24.008	CR131	1	F	R99	3.2.1	3.3.0	Extended Transaction Identifier
N1-000114	24.008	CR123		C	R99	3.2.1	3.3.0	GSM Cleanup – Removal of V.23
N1-000543	29.018	CR007	3	B	R99	3.2.0	3.3.0	Introduction of the Service Area Identification
N1-000516	24.011	CR004	1	F	R99	3.2.0	3.3.0	Reintroduction of deleted arrow diagrams
N1-000456	24.008	CR181		C	R99	3.2.1	3.3.0	Removal of X.25 for packet domain services
N1-000546	23.122	CR004	1	D	R99	3.1.1	3.2.0	UTMS references in 23.122

3GPP TSG-CN WG1 #11
Umeå, Sweden, 28 Feb - 3 Mar. 2000

Document N1-000357
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

24.011	CR	005	Current Version:	3.1.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to: CN#07 *list expected approval meeting # here ↑*

for approval [X] for information [ ] strategic [ ] non-strategic [ ] *(for SMG use only)*

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)* (U)SIM [ ] ME [X] UTRAN / Radio [ ] Core Network [X]

Source: CN1 **Date:** 2000-02-21

Subject: Cleaning up the References

Work item: TEI

Category: *(only one category shall be marked with an X)*

F	Correction	[ ]
A	Corresponds to a correction in an earlier release	[ ]
B	Addition of feature	[ ]
C	Functional modification of feature	[ ]
D	Editorial modification	[X]

Release:

Phase 2	[ ]
Release 96	[ ]
Release 97	[ ]
Release 98	[ ]
Release 99	[X]
Release 00	[ ]

Reason for change: Cleaning up the references to be aligned with 3G specs.

Clauses affected:

Other specs affected:

Other 3G core specifications	[ ]	→ List of CRs:
Other GSM core specifications	[ ]	→ List of CRs:
MS test specifications	[ ]	→ List of CRs:
BSS test specifications	[ ]	→ List of CRs:
O&M specifications	[ ]	→ List of CRs:

Other comments:


help.doc

<--------- double-click here for help and instructions on how to create a CR

Foreword

This Technical Specification has been produced by the 3GPP.

This TS defines the Short Message Service (SMS) support on mobile radio interface within the 3GPP system.

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of this TS, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version 3.y.z

where:

x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

3 Indicates TSG approved document under change control.

y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z the third digit is incremented when editorial only changes have been incorporated in the specification;

1 Scope

This Technical Specification (TS) specifies the procedures used across the mobile radio interface by the signalling layer 3 function Short Message Control (SMC) and Short Message Relay function (SM-RL) for both circuit switched GSM and GPRS.

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.

[1] GSM 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".

[1a] TR 21.905: " Vocabulary for 3GPP Specifications".

[2] TS 23.040: "Technical realization of the Short Message Service (SMS) Point-to-Point (PP)".

[3a] TS 23.060: "General Packet Radio Service (GPRS); Service description; Stage 2".

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

[4] TS 24.007: "Mobile radio interface signalling layer 3; General aspects".

[5] TS 24.008: "Mobile radio interface layer 3 specification".

[6a] GSM 04.64: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Logical Link Control (LLC)".

[6] ISO 7498: "Information processing systems - Open Systems Interconnection - Basic Reference Model".

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

1.2 Abbreviations

Abbreviations used in this TS are listed in GSM 01.04 and 3G TR 21.905, except below:

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.

GPRS: Packet Services for GSM and UMTS system.

The label **(GSM only)** indicates this section 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 section 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 TS GSM 02.17). This specification makes no distinction between SIM and USIM.

MS, Mobile Station. This specification makes no distinction between MS and UE.

2 Overview of Short Message Service (SMS) support

The purpose of the Short Message Service is to provide the means to transfer messages between a GSM PLMN Mobile Station (MS) and a Short Message Entity via a Service Centre, as described in TS 23.040. The terms "MO" - Mobile Originating - and "MT" - Mobile Terminating - are used to indicate the direction in which the short message is sent.

This TS describes the procedures necessary to support the Short Message Service between the MS and the MSC or SGSN and vice versa, as described in TS 23.040.

The procedures are based on services provided by the Mobility Management sublayer as described in TS24.007/24.008 for GSM CS and UMTS CS/PS services and the Logical Link Control layer described in GSM 04.64 for GPRS services.

2.1 Protocols and protocol architecture

The hierarchical model in Figure 2.1a shows the layer structure of the MSC and the MS in GSM. The hierarchical model in Figure 2.1c shows the layer structure of the SGSN and the MS in UMTS.

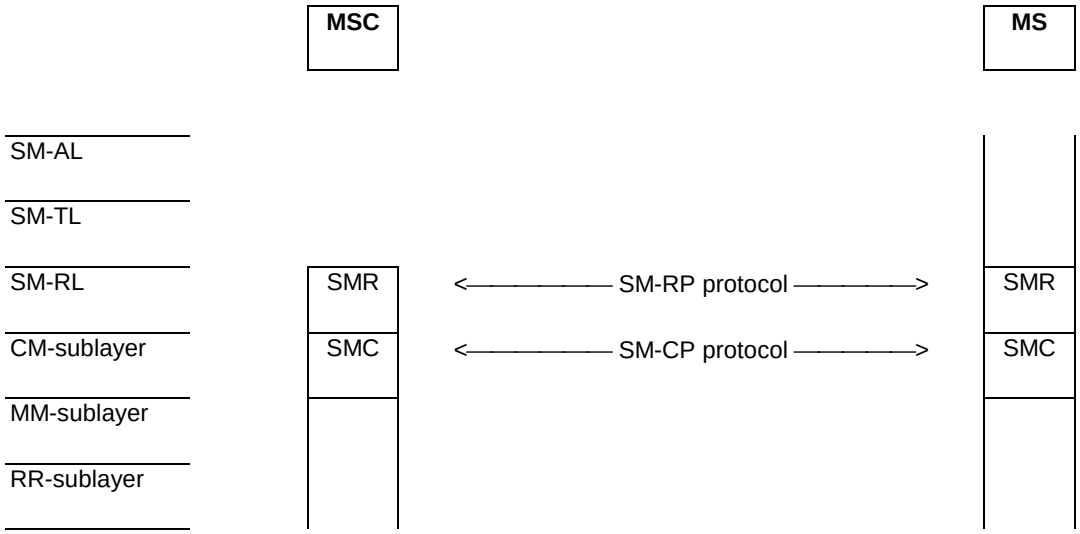


Figure 2.1a/TS 24.011: Protocol hierarchy for circuit switched service

The hierarchical model in Figure 2.1b shows the layer structure of the SGSN and the MS.

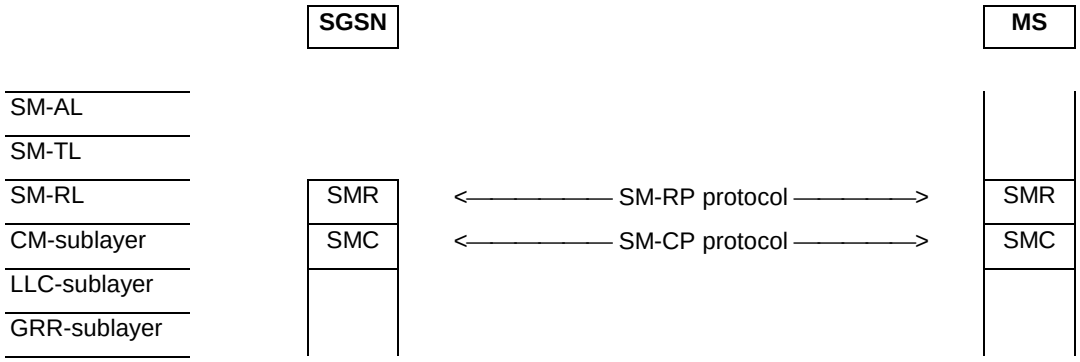


Figure 2.1b/TS 24.011: Protocol hierarchy for GPRS in GSM

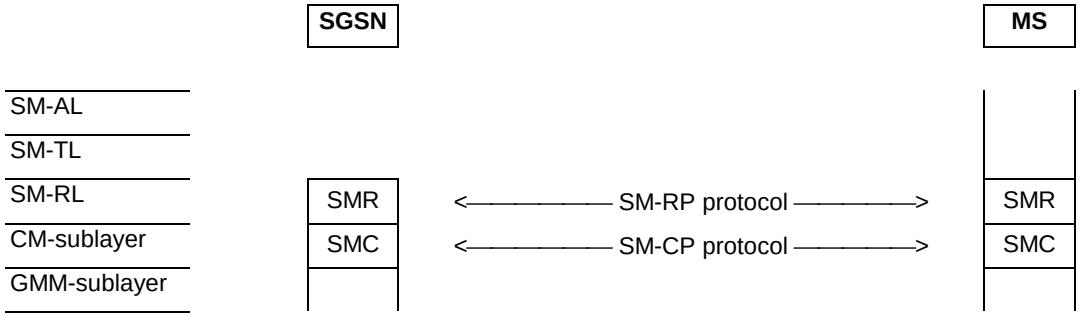


Figure 2.1c/24.011: Protocol hierarchy for packet switched service in UMTS

The CM-sublayer, in terms of the Short Message Service Support, provides services to the Short Message Relay Layer.

On the MS-side the Short Message Relay Layer provides services to the Short Message Transfer Layer. The Short Message Relay Layer is the upper layer on the network side (MSC or SGSN), and the SM-user information elements are mapped to TCAP/MAP.

The peer protocol between two SMC entities is denoted SM-CP, and between two SMR entities, SM-RP.

Abbreviations:

SM-AL	Short Message Application Layer
SM-TL	Short Message Transfer Layer

SM-RL	Short Message Relay Layer	
SM-RP	Short Message Relay Protocol	
SMR	Short Message Relay (entity)	
CM-sub	Connection Management sublayer	
SM-CP	Short Message Control Protocol	
SMC	Short Message Control (entity)	
MM-sub:	Mobility Management sublayerGMM-sub:	GPRS Mobility Management sublayer
RR-sub:	Radio Resource Management sublayer	
LLC-sub	Logical Link Control sublayer	
GRR-sub	GPRS Radio Resource sublayer in GSM	

2.2 Use of channels (GSM only)

Table 2.1/TS 24.011 summarizes the use of channels for the short message service for circuit switched GSM. Arrows indicate changes of channel.

Table 2.1/TS 24.011: Channels used for short message transfer over circuit switched GSM

Channel dependency	Channel used
TCH not allocated	SDCCH
TCH not allocated -> TCH allocated	SDCCH -> SACCH
TCH allocated	SACCH
TCH allocated -> TCH not allocated	SACCH -> SACCH opt. SDCCH[3]

The short message service for GPRS shall be supported by a PDTCH.

2.3 Layer 2 SAPI 3 handling for circuit switched GSM

General rule:

The Radio Resource Management (RR reference GSM 04.~~08~~18) in the Mobile Station and on the network side (i.e. in the BSC) shall establish the acknowledged mode of operation on SAPI 3 whenever needed, i.e. when a message requiring SAPI 3 transfer shall be transmitted.

RR shall control the layer 2 also for SAPI 3, and keep knowledge of the mode.

The network side may initiate release of the acknowledged mode for SAPI 3 either explicitly (by the use of DISC- and UA-frames, see GSM 04.06) or indirectly by channel release (see GSM 04.~~08~~18).

This means:

- the Mobile Station side will initiate establishment of SAPI 3 acknowledged mode in the case of mobile originating short message transfer;
- the network side will initiate establishment of SAPI 3 acknowledged mode in the case of mobile terminating short message transfer;
- the network side may choose to keep the channel and the acknowledged mode of operation to facilitate transfer of several short messages for or from the same Mobile Station. The queuing and scheduling function for this should reside in the MSC.

2.4 Layer 2 (LLC) GPRS support (GSM only)

It shall be possible for a GPRS-attached MS of any class (A, B, C) to send and receive short messages over GPRS radio channels.

GPRS shall use the unacknowledged mode of LLC frame transfer as described in GSM 04.64, and shall use SAPI 7 to identify the SMS Logical Link Entity within the LLC layer.

A description of the different GPRS MS classes can be found in 23.060~~03.60~~, and a brief overview is given below:-

- Class A/B MSs may be able to send and receive short messages using either the MM sublayer (using SACCH or SDCCH) or the LLC layer (using PDTCH).

- Class C MSs may be able to send and receive short messages using only the LLC layer (using the PDTCH). The capability for GPRS-attached class-C MSs to receive and transmit SMS messages is optional.

The GSMS entity for GPRS class A/B MS is shown in Figure 3. The GSMS shall communicate with the MM entity via the GMMSMS-SAP for GPRS Class A/B MO SMS, in order to ascertain which transport service to use.

SMS delivery via GPRS is normally a more radio resource efficient method than SMS delivery via CS GSM. The delivery path for MO SMS is selected by the MS.

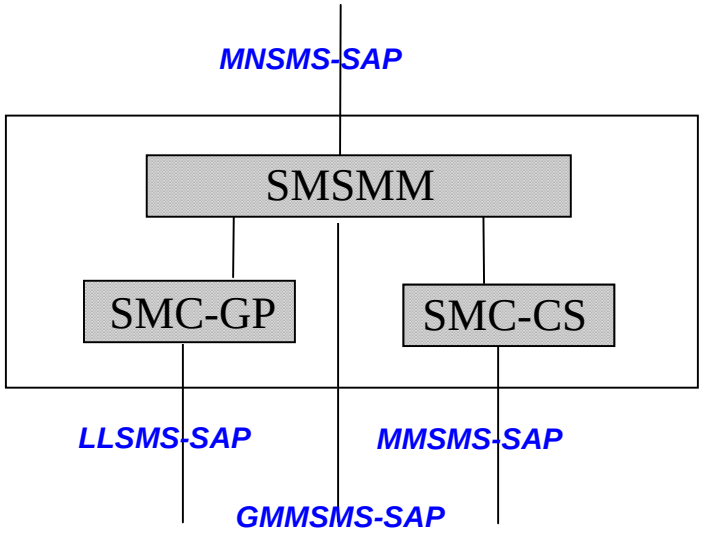


Figure 2.23/TS 24.011: GSMS entity for GPRS Class A/B MS

2.5 GSMS entity in UMTS

It shall be possible for a PS-attached MS of any mode of operation to send and receive short messages over UMTS radio channels.

A description of the different mode of operation UMTS MS can be found in 23.060, and a brief overview is given below:-

- CS/PS mode of operation MSs may be able to send and receive short messages using either the MM sublayer or the GMM sublayer.

- PS mode of operation MSs may be able to send and receive short messages using only GMM sublayer.

The GSMS entity for CS/PS mode of operation MS is shown in Figure 2.3X. The GSMS shall communicate with the MM entity via the GMMSMS-SAP for UMTS CS/PS mode of operation MO SMS, in order to ascertain which transport service to use.

The delivery path for MO SMS is selected by the MS.

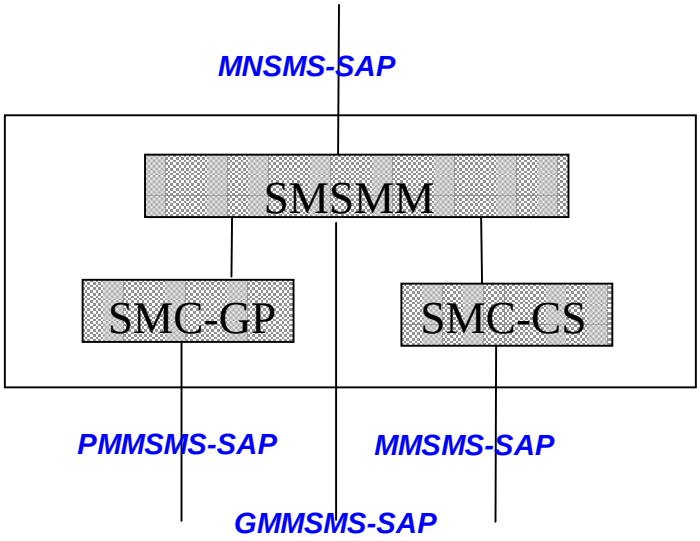


Figure 42.3/TS 24.011: GSMS entity for CS/PS mode of operation MS in UMTS

3 Service definition

3.1 General

The layer service is described as a set of service primitives. These service primitives are abstractions and attempt to capture only those details of the interaction between the entities that are aspects of the layer service itself. A service primitive neither specifies nor constrains the implementation of entities or the interface between them.

The general syntax of a primitive and the initials of them are in line with the 0424-series of GSM 3G Technical Specifications.

NOTE: In order to limit the number of primitives and state definitions to a reasonable amount, a description method has been chosen which does not claim to be totally in line with the formal description method of the layered ISO reference model (ISO 7498) for Open Systems Interconnection.

3.2 Service provided by the CM-sublayer

In order to support the Short Message Service, the CM-sublayer provides services to the Short Message Relay Layer.

The CM-sublayer services are provided using layer specific functions and lower layer services offered to the CM-sublayer, controlled by short message service control entities called SMCs.

An SMC entity in the MS communicates with an SMC entity in the MSC or SGSN by means of a peer protocol, SM-CP (Short Message Service Control Protocol). The arrow diagrams in annex A give an overview of the messaging on the CM-sublayer during a short message transfer.

A mobile station supporting the Short Message Service shall have a minimum of two SMC entities per service type (i.e. two for CS GSM and two for GPRS). This enables the MS to receive MT messages during an MO message transfer.

To ensure that an MS having the minimum of two SMC entities is able to receive MT messages during an MO message transfer, and to send MO messages during MT message transfer, parallel message transfer in the same direction is prohibited. This means that the SMC entities shall not simultaneously perform messaging in the same direction. The rules for concatenation of message transfers are described in subclause 5.4.

The MSC or SGSN shall have a minimum of two SMC entities available each during an MT message transfer to a mobile station, one being reserved for MO message transfer. In an MO message transfer, the MSC or SGSN shall have one SMC entity reserved for handling of an MT message.

3.2.1 Definition of primitives on the MS side

This subclause defines the service primitives used on the MS side. Table 3.1/TS 24.011 gives an overview of the service primitives and main parameter linked to the primitives. All necessary control parameters to be used in the Short Message Service are defined in clause 7. All MNSMS service primitives defined in this subclause are passed to an SMC-entity.

Table 3.1/TS 24.011: MNSMS service primitives on the MS-side

SERVICE PRIMITIVES		PARAMETER
NAME	TYPE	
MNSMS-ABORT-	Req	Cause
MNSMS-DATA	Req	MT RPDU
	Ind	MO RPDU
MNSMS-EST-	Req	MO RPDU
	Ind	MT RPDU
MNSMS-ERROR-	Ind	Cause
MNSMS-REL-	Req	Cause

3.2.1.1 MNSMS-ABORT-REQuest

A request from an SMR entity to release a CM-connection in abnormal cases.

When the CM-sublayer receives this request, and if the MM connection exists, it shall form and send the CP-ERROR message. Irrespective of whether or not the CP-ERROR message was sent, the CM-sublayer shall then release the lower layer services.

3.2.1.2 MNSMS-DATA-REQuest

A request from an SMR entity to send a RPDU on the established CM-connection.

The SMC entity forms the CP-DATA message, the user information element being the RPDU, and transfers the message by means of the lower layer services.

NOTE: After reception of an incoming RP-DATA, the SMR entity typically returns the acknowledgement RP-ACK, or an error indication, RP-ERROR, to the Service Centre.

3.2.1.3 MNSMS-DATA-INDication

An indication used by the SMC entity to pass the user information element (RPDU) of a received CP-DATA message to SM-RL.

NOTE: The RPDU is typically an RP-ACK or an RP-ERROR. Normally this service is used to report the outcome of either a MO message transfer attempt or a mobile station memory available notification attempt.

3.2.1.4 MNSMS-ESTablish-REQuest

A request from an SMR entity to establish a CM-connection. The request contains a RP-DATA UNIT as a parameter. It implies the:

- establishment of a CM-connection for this SMR entity;
- forming of the CP-DATA message containing the RPDU; and
- passing of CP-DATA to the MM-sublayer.

3.2.1.5 MNSMS-ESTablish-INDication

An indication used by the SMC entity to pass the SM-user information (RPDU) of a received CP-DATA message to SM-RL. It implies completion of the establishment of the CM-connection for this SMR entity.

3.2.1.6 MNSMS-ERROR-INDication

An indication used by the SMC entity to pass error information to SM-RL. The error information may be local or relayed by the CP-ERROR message.

Use of this service primitive implies release of both CM and MM-connection.

3.2.1.7 MNSMS-RELease-REQuest

A request to release the CM-connection (if it still exists).

Use of this service primitive implies release of the associated CM and MM-connections.

3.2.2 Definition of primitives on the network side

This subclause defines the service primitives used on the network side.

Table 3.2/TS 24.011 gives an overview of the service primitives and linked main parameter. All MNSMS service primitives defined in this subclause are passed to an SMC-entity.

Table 3.2/TS 24.011: MNSMS service primitives on the network side

SERVICE PRIMITIVES		PARAMETER
NAME	TYPE	
MNSMS-ABORT-	Req	Cause
MNSMS-DATA	Req	MO RPDU
	Ind	MT RPDU
MNSMS-EST-	Req	MT RPDU
	Ind	MO RPDU
MNSMS-ERROR-	Ind	Cause
MNSMS-REL-	Req	Cause

3.2.2.1 MNSMS-ABORT-REQuest

A request from an SMR entity to release a CM-connection in abnormal cases.

When the CM-sublayer receives this request, it may form and send the CP-ERROR message to release the connection. Irrespective of whether or not the CP-ERROR message was sent, the CM-sublayer shall then release the lower layer services.

3.2.2.2 MNSMS-DATA-REQuest

A request from an SMR entity to send a RPDU on the established CM-connection.

The SMC entity forms the CP-DATA message, the user information element being the RPDU, and transfers the message by means of the lower layer services.

NOTE: After reception of an incoming RP-DATA or RP-SMMA the RPDU typically returns the acknowledgement, RP-ACK, or an error indication RP-ERROR, to the Mobile Station.

3.2.2.3 MNSMS-DATA-INDication

An indication used by the SMC entity to pass the user information element (RPDU) of a received CP-DATA message to SM-RL.

NOTE: The RPDU is typically an RP-ACK or an RP-ERROR. Normally this is used to report the outcome of a MT messaging attempt.

3.2.2.4 MNSMS-ESTablish-REQuest

A request from an SMR entity to transmit a RPDU, containing the SM-user information element; it implies the:

- establishment of a CM-connection for this SMR entity;
- forming of the CP-DATA message containing the RPDU; and
- passing of CP-DATA to the MM-sublayer.

3.2.2.5 MNSMS-ESTablish-INDication

An indication used by the SMC entity to pass the SM-user information (RPDU) of a received CP-DATA message to SM-RL; it implies completion of the establishment of the CM-connection for this SMR entity.

3.2.2.6 MNSMS-ERROR-INDication

An indication used by the SMC entity to pass error information to SM-RL. The error information may be local or relayed by the CP-ERROR message.

Use of the service primitive implies release of both CM and MM-connection.

3.2.2.7 MNSMS-RELease-REQuest

A request to release the CM-connection (if it still exists).

Use of this service implies release of the associated CM and MM-connections.

3.3 Service provided by SM-RL

In order to support the Short Message Service, the Short Message Relay Layer provides services to the Short Message Transfer Layer.

The Short Message Relay Layer services are provided using layer specific functions and lower layer services offered to the Short Message Relay Layer, controlled by short message control entities called SMRs.

An SMR entity in the MS communicates with an SMR entity in the MSC by means of a peer protocol, SM-RP (Short Message Relay Protocol). The arrow diagrams in annex C give an overview of the messaging on the Short Message Relay Layer used for the Short Message Service. The diagrams in annex C indicate a layer RL. This is not a layer, but the functional interface to the fixed network. The SM-RL is the upper layer in the MSC. Consequently the service primitives passed between SM-RL and RL indicate the interworking function.

The requirements on the SM-RL are the same as for the CM-sublayer. This means that there is exactly one SMR entity for each SMC entity, operating as described in subclause 3.2.

3.3.1 Definition of primitives on the MS side

This subclause defines the service primitives used on the MS side. Table 3.3/TS 24.011 gives an overview of the service primitives and linked main parameters. All SM-RL service primitives defined in this subclause are passed on an SM-RL-connection.

Table 3.3/TS 24.011: SM-RL service primitives on the mobile station side

SERVICE PRIMITIVES		PARAMETER
NAME	TYPE	
SM-RL-DATA-	Req	MO SMS-TPDU
	Ind	MT SMS-TPDU
SM-RL-MEMORY AVAILABLE	Req	See subclause 3.3.1.3
SM-RL-REPORT-	Req	See subclause 3.3.1.4
	Ind	See subclause 3.3.1.5

3.3.1.1 SM-RL-DATA-REQuest

A request from the SM-TL entity to pass the SMS-TPDU and necessary control information to SM-RL; it implies:

- establishment of an SM-RL connection for MO message transfer;
- forming of the RP-DATA message, containing the SMS-TPDU;
- transfer of the RP-DATA message as an RPDU in an MNSMS-EST-Req.

The purpose of this service is to relay the SMS-TPDU from the mobile station to the peer entity in the MSC.

3.3.1.2 SM-RL-DATA-INDication

An indication used by the SMR entity to pass the SMS-TPDU and necessary control information of a received RP-DATA message to SM-TL.

3.3.1.3 SM-RL-MEMORY-AVAILABLE-REQuest

When received without a parameter, this is a request from the SM-TL entity to pass the necessary control information to SM-RL; it implies:

- establishment of an SM-RL-connection for transfer of the notification to the network that the mobile has memory available to receive one or more short messages;
- forming the RP-SM-MEMORY-AVAILABLE message; and
- transfer of the RP-SM-MEMORY-AVAILABLE message as an RPDU in an MNSMS-EST-Req.

The SM-TL entity may abort the transmission of an RP-SM-MEMORY-AVAILABLE message by use of a SM-RL-MEMORY-AVAILABLE-REQuest with the added parameter, SMS-MEM-NOTIF-ABORT, being present. This parameter is, of course, defined only on the interface between the SM-TL and SMR entities within the mobile station. Use of this request with the added parameter will have no effect on messages already given to the lower layers for transmission, but will only abort retransmission of the RP-SM-MEMORY-AVAILABLE message by the SMR entity.

3.3.1.4 SM-RL-REPORT-REQest

A request used by the SM-TL to relay the RP-ACK or RP-ERROR message from the mobile station to the network. This implies transfer of the RP-ACK or RP-ERROR message as an RPDU in an MNSMS-DATA-Req.

3.3.1.5 SM-RL-REPORT-INDication

An indication used by the SMR entity to pass an acknowledgement (RP-ACK) or error information to SM-TL. The error information may be local or relayed by the RP-ERROR message; it consists of an appropriate cause and optionally extended diagnostic information.

3.3.2 Definition of primitives on the network side

This subclause defines the service primitives used on the network side.

Table 3.4/TS 24.011 gives an overview of the service primitives and linked main parameter. All SM-RL service primitives defined in this subclause are passed on an SM-RL-connection.

Table 3.4/TS 24.011: SM-RL service primitives on the network side

SERVICE PRIMITIVES		PARAMETER
NAME	TYPE	
SM-RL-DATA-	Req	MT SMS-TPDU
	Ind	MO SMS-TPDU
SM-RL-MEMORY AVAILABLE	Ind	None
SM-RL-REPORT-	Req	See subclause 3.3.2.4
	Ind	See subclause 3.3.2.5

3.3.2.1 SM-RL-DATA-REQuest

A request from RL to pass the SMS-TPDU to SM-RL; it implies:

- establishment of a SM-RL-connection for MT message transfer;
- forming of the RP-DATA message, containing the SMS-TPDU; and
- transfer of the RP-DATA message as an RPDU in an MNSMS-EST-Req.

The purpose of this service is to relay the SMS-TPDU from the MSC to the peer entity in the mobile station.

3.3.2.2 SM-RL-DATA-INDication

An indication used by the SMR entity to pass the SMS-TPDU of a received RP-DATA message to RL.

3.3.2.3 SM-RL-MEMORY-AVAILABLE-INDication

An indication used by the SMR entity to pass to RL the notification to the network that the mobile has memory available to receive one or more short messages.

3.3.2.4 SM-RL-REPORT-REQuest

A request used by RL (the network interworking function) to relay the RP-ACK or RP-ERROR message from the network to the mobile station. This implies transfer of the RP-ACK or RP-ERROR message as an RPDU in an MNSMS-DATA-Req.

3.3.2.5 SM-RL-REPORT-INDication

An indication used by the SMR entity to pass an acknowledgement (RP-ACK) or error information to RL. The error information may be local or relayed by the RP-ERROR message.

4 [Spare]

5 CM-procedures

5.1 General

This clause describes the procedures used by the SMC entity on the Connection Management sublayer. An SMC entity communicates with a corresponding peer entity using an MM-connection for CS GSM/UMTS or the LLC layer for GPRS in GSM or the GMM-connection in for PS in UMTS.

Multiple MM-connections may be established at the same time, allowing parallel transactions. The description of the procedures is related to one single transaction.

For circuit switched service, the CM-procedures described can only be performed if an MM-connection has been established between the mobile station and the network.

For GPRS, no connection has to be established, and thus the CM procedures for GPRS reflect this. Detailed SDL diagrams for SMC entities are contained in annex B.

5.2 Short Message Control states

The state transition diagrams for the MO and MT SMC entities on both the MS side and network side are contained in annex B.

5.2.1 SMC-CS states at the MS side of the radio interface

5.2.1.1 Mobile Originating Case

The states described in this clause are for an SMC entity in an MS handling mobile originating short message transfer and notification to the network that the mobile has memory available to receive one or more short messages (referred to below as "notification").

5.2.1.1.1 MO-Idle (State 0)

This state exists when the MO-SMC entity is in idle mode, or when an MO short message transfer or notification ends in a normal or abnormal way.

5.2.1.1.2 MO-MM-connection pending (State 1)

This state exists when the MO-SMC has requested the establishment of an MM-connection.

5.2.1.1.3 MO-Wait for CP-ACK (State 2)

This state exists after the MO-SMC has initiated the transfer of a CP-DATA message.

5.2.1.1.4 MO-MM-connection established (State 3)

This state exists when the MO-SMC has:

- received the acknowledgement, CP-ACK; or
- received the message CP-DATA (including sending of the associated CP-ACK).

5.2.1.2 Mobile Terminating case

The states described in this subclause are for an SMC entity in an MS handling mobile terminating short message transfer.

5.2.1.2.1 MT-Idle (State 0)

This state exists when the MT-SMC entity is in idle mode, or when a short message transfer ends in a normal or abnormal way.

5.2.1.2.2 MT-Wait for CP-ACK (State 2)

This state exists after the MT-SMC has initiated the transfer of a CP-DATA message.

5.2.1.2.3 MT-MM-connection established (State 3)

This state exists when the MT-SMC has:

- received the acknowledgement, CP-ACK; or
- received the message CP-DATA (including sending of the associated CP-ACK).

5.2.2 SMC-GP states at the MS side of the radio interface

5.2.2.1 Mobile Originating Case

The states described in this clause are for an SMC-GP entity in a GPRS MS handling mobile originating short message transfer and notification to the network that the mobile has memory available to receive one or more short messages (referred to below as "notification").

5.2.2.1.1 MO-Idle (State 0)

This state exists when the MO-SMC entity is in idle mode, or when an MO short message transfer or notification ends in a normal or abnormal way.

5.2.1.1.2 MO-GMM-connection pending (State 1) (UMTS only)

This state exists when the MO-SMC has requested the establishment of an PS signalling connection.

5.2.2.1.3 MO-Wait for CP-ACK (State 2)

This state exists after the MO-SMC has initiated the transfer of a CP-DATA message.

5.2.2.1.4 MO-Wait for CP-Data (State 3)

This state exists when the MO-SMC has received the acknowledgement, CP-ACK.

5.2.2.2 Mobile Terminating case

The states described in this subclause are for an SMC-GP entity in an GPRS MS handling mobile terminating short message transfer.

5.2.2.2.1 MT-Idle (State 0)

This state exists when the MT-SMC entity is in idle mode, or when a short message transfer ends in a normal or abnormal way.

5.2.2.2.2 MT-Wait for RP-ACK (State 1)

This state exists after the MT-SMC has received the message CP-DATA (including sending of the associated CP-ACK)

5.2.2.2.3 MT-Wait for CP-ACK (State 2)

This state exists when the MT-SMC has initiated the transfer of the CP DATA message.

5.2.3 SMC-CS states at the network side of the radio interface

5.2.3.1 Mobile Originating Case

The states described in this subclause are for an SMC entity in an MSC handling both mobile originating short message transfer and notification to the network that the mobile has memory available to receive one or more short messages (referred to below as "notification").

5.2.3.1.1 MO-Idle (State 0)

This state exists when the MO-SMC entity is in idle mode, or when a short message transfer or notification ends in a normal or abnormal way.

5.2.3.1.2 MO-Wait for CP-ACK (State 2)

This state exists after the MO-SMC has initiated the transfer of a CP-DATA message.

5.2.3.1.3 MO-MM-connection established (State 3)

This state exists when the SMC has:

- received the acknowledgement, CP-ACK; or
- received the message CP-DATA (including sending of the associated CP-ACK).

5.2.3.2 Mobile Terminating Case

The states described in this subclause are for an SMC entity in an MSC handling mobile terminating short message transfer.

5.2.3.2.1 MT-Idle (State 0)

This state exists when the MT-SMC entity is in idle mode, or when a short message transfer ends in a normal or abnormal way.

5.2.3.2.2 MT-MM-connection pending (State 1)

This state exists when the MT-SMC has requested an MM-connection for mobile terminating short message transfer.

5.2.3.2.3 MT-Wait for CP-ACK (State 2)

This state exists after the SMC has initiated the transfer of a CP-DATA message.

5.2.3.2.4 MT-MM-connection established (State 3)

This state exists when the SMC has:

- received the acknowledgement, CP-ACK; or
- received the message CP-DATA (including sending of the associated CP-ACK).

5.2.4 SMC-GP states at the network side of the radio interface

5.2.4.1 Mobile Originating Case

The states described in this subclause are for an SMC-GP entity in an SGSN handling both mobile originating short message transfer and notification to the network that the mobile has memory available to receive one or more short messages (referred to below as "notification").

5.2.4.1.1 MO-Idle (State 0)

This state exists when the MO-SMC entity is in idle mode, or when a short message transfer or notification ends in a normal or abnormal way.

5.2.4.1.2 MO-Wait for RP-ACK (State 1)

This state exists after the MO-SMC has received the message CP-DATA (including sending of the associated CP-ACK).

5.2.4.1.3 MO-Wait for CP-ACK(State 2)

This state exists when the SMC hasreceived the RP acknowledgement, RP-ACK

5.2.4.2 Mobile Terminating Case

The states described in this subclause are for an SMC-GP entity in an SGSN handling mobile terminating short message transfer.

5.2.4.2.1 MT-Idle (State 0)

This state exists when the MT-SMC entity is in idle mode, or when a short message transfer ends in a normal or abnormal way.

5.2.4.2.2 MT-Wait for CP-ACK (State 1)

This state exists after the SMC has initiated the transfer of a CP-DATA message.

5.2.4.2.3 MT-Wait for CP DATA (State 2)

This state exists when the SMC has received the acknowledgement, CP-ACK.

5.3 Short Message Control procedures

The procedures needed for short message control are:

- connection establishment procedures;
- RP Data Unit (RPDU) transfer procedures;
- connection release procedures; and
- procedures for abnormal cases.

The procedures of subclause 5.3 are described with respect to one particular instance of an SMC entity. Different SMC entities are identified by their Transaction Identifier. Messages with Transaction Identifiers that do not correspond to this particular instance of the SMC entity are not treated by it.

5.3.1 MM-connection establishment for circuit switched serviceWhen an SMC entity is in the Idle state and transfer of an RPDU is requested, the peer to peer connection between the MM-sublayers in the MS and the network (MSC) has to be established.

The SMC entity on the originating side requests the MM-sublayer to establish an MM-connection, and enters the MM-Connection Pending state.

After completion of the MM-connection establishment, a confirmation is given to the originating side to indicate that the MM sublayer is ready for RPDU transfer.

The MM-connection establishment is indicated to the SMC entity at the destination side when the CP-DATA message has been received by the MM-sublayer (in line with 24.008). The destination side SMC entity then sends a CP-ACK and enters the MM-Connection Established state.

5.3.2.1 RPDU transfer for circuit switched service

In GSM, when an SMC entity in the MM-Connection Pending state is informed that an MM-connection has been established, the SMC entity forwards the CP-DATA message containing the RPDU, sets the timer TC1* and enters the Wait for CP-ACK state.

In UMTS, when an SMC-GP entity in the MS side is in the Idle state and transfer of an RPDU is requested, the SMC-GP entity on the originating side requests the MM-sublayer to establish an PS signalling connection, and enters the GMM-Connection Pending state.

In UMTS, in the MS, after completion of the PS signalling connection establishment, a confirmation is given to the originating side to indicate that the MM sublayer is ready for RPDU transfer.

In UMTS, in the MS, after confirmation of the PS signalling connection establishment, , the SMC-GP entity on the originating side forwards the CP-DATA message to the GMM sublayer. This contains the RPDU, and also the SMC-GP entity sets the timer TC1* and enters the Wait for CP-ACK state.

In UMTS, when an SMC-GP entity in the network side is in Idle state and transfer of an RPDU is requested, the SMC-GP entity on the originating side forwards the CP-DATA message to the GMM sublayer. This contains the RPDU, and also the SMC-GP entity sets the timer TC1* and enters the Wait for CP-ACK state.

The value of TC1* may vary with the length of the CP-DATA message and the channel type that is being used for its transmission. However, the value of TC1* shall be sufficiently great to allow the lower layers to transmit the CP-DATA and CP-ACK messages and to allow for some retransmissions of layer 2 frames.

If an SMC entity in the Wait for CP-ACK state gets an indication that the CP-DATA message has probably been lost (e.g. due to dedicated channel assignment, hand over, assignment failure, hand over failure, or a SAPI 3 data link failure) then, as an implementation option, that SMC entity may reduce the time until expiry of TC1*.

If the timer TC1* expires in the Wait for CP-ACK state, the CP-DATA message is retransmitted and the state Wait for CP-ACK is re-entered. The maximum number of CP-DATA message retransmissions is an implementation option but shall be either 1, 2 or 3. If the timer TC1* expires after the maximum number of retransmission attempts, an error

indication is passed to SM-RL and an MM-connection release request is passed to the MM-sublayer. The Idle state is then entered.

On receipt of the CP-ACK message in the Wait for CP-ACK state, the SMC resets the timer TC1* and enters the MM-Connection Established state.

In GSM, when receiving a CP-DATA message in the MM-Connection Established state, the SMC entity checks the parameters relevant to the CP protocol. If these are valid, the RPDU is passed to the SM-RL, the CP-ACK message is sent and the state MM-Connection Established is re-entered.

In UMTS, when receiving a CP-DATA message from the GMM sublayer, the SMC-GP entity checks the parameters relevant to the CP protocol. If these are valid, the RPDU is passed to the SM-RL, the CP-ACK message is sent.

If an SMC entity in the Idle state is unable to accept a CP-DATA message, it sends a CP-ERROR message followed by an MM-connection release request and then enters the Idle state.

When receiving a MNSMS-DATA-Req primitive in the MM-Connection Established state, the SMC entity forwards a CP-DATA message containing the RPDU to the MM-sublayer, sets the timer TC1* and enters the Wait for CP-ACK state.

5.3.2.2 RPDU transfer for GPRS

When an SMC-GP entity is in the Idle state and transfer of an RPDU is requested, the SMC-GP entity on the originating side forwards the CP-DATA message to the LLC sublayer. This contains the RPDU, and also the SMC-GP entity sets the timer TC1* and enters the Wait for CP-ACK state.

The value of TC1* may vary with the length of the CP-DATA. However, the value of TC1* shall be sufficiently great to allow the lower layers to transmit the CP-DATA and CP-ACK messages and to allow for some re-transmissions of layer 2 frames.

If an SMC entity in the Wait for CP-ACK state gets an indication that the CP-DATA message has probably been lost then, as an implementation option, that SMC-GP entity may reduce the time until expiry of TC1*.

If the timer TC1* expires in the Wait for CP-ACK state, the CP-DATA message is retransmitted and the state Wait for CP-ACK is re-entered. The maximum number of CP-DATA message re-transmissions is an implementation option but shall be either 1, 2 or 3. If the timer TC1* expires after the maximum number of retransmission attempts, an error indication is passed to SM-RL. The Idle state is then entered.

On receipt of the CP-ACK message in response to the CP-DATA (RP DATA) message in the Wait for CP-ACK state, the SMC-GP resets the timer TC1* and enters the Wait for CP DATA state.

On receipt of the CP-ACK message in response to the CP-DATA (RP ACK) message in the Wait for CP-ACK state, the SMC-GP resets the timer TC1* and enters the Idle State.

When receiving a CP-DATA message form the LLC sublayer, the SMC-GP entity checks the parameters relevant to the CP protocol. If these are valid, the RPDU is passed to the SM-RL, the CP-ACK message is sent.

If an SMC entity in the Idle state is unable to accept a CP-DATA message, it sends a CP-ERROR message and then enters the Idle state.

5.3.3 Release of MM and CM connections

With the exception of error situations, release of the MM and CM connection is controlled by the SM-RL.

When an SMC entity in the Wait for CP-ACK state receives a release request from SM-RL, this request is stored until the next state (either MM Connection Established or Idle) is entered. If the Idle state is entered, the request is discarded. If the MM Connection Established state is entered, or if the SMC entity receives a release request from SM-RL in this state, an MM-connection release request is sent to the MM-sublayer and the SMC entity enters the Idle state.

5.3.4 Abnormal cases

Abnormal cases that shall be handled by the SMC entity in any state can be classified into five cases:

- Upper Layer Abort: Errors occurring in the SM-RL may cause the SM-RL to send an MNSMS-ABORT Request to the SMC entity.

- CP-Layer Abort: Errors occurring within the SMC entity itself may require termination of all activities related to that transaction identifier.

- Lower Layer Abort: Errors occurring within the layers beneath the CP-layer may cause an MMSM-ERROR Indication or a GMMSMS-ERROR Indication to be sent to the SMC entity.

- CP-Layer Protocol Errors: Errors occurring within the protocol exchange between the SMC entities may result in the sending of a CP-ERROR message between the entities.

- Lower Layer Release: Events occurring within the layers beneath the CP layer may cause an MMSM-REL Indication to be sent to the SMC entity.

When the CM-sublayer in the network receives an Upper Layer Abort, it may form and send the CP-ERROR message to release the connection. Irrespective of whether or not the CP-ERROR message was sent, an MM-connection release request, without indication of release cause, is passed to the MM-sublayer. The SMC entity in the network then enters the Idle state.

When the CM-sublayer in the MS receives an Upper Layer Abort and if the MM connection exists, it shall form and send the CP-ERROR message. Irrespective of whether or not the CP-ERROR message was sent, an MM-connection release request, without indication of release cause, is passed to the MM-sublayer. The SMC entity in the mobile station then enters the Idle state.

In the case of a CP-Layer Abort, an error indication is passed to SM-RL. If possible, a CP-ERROR message is sent to the partner SMC entity to indicate the error situation. Then the SMC entity enters the Idle state.

In the case of a Lower Layer Abort, the SMC entity passes an error indication to SM_RL, an MM-connection release request is passed to the MM-sublayer, and the SMC entity immediately enters the Idle state.

In the case of the reception of a CP-ERROR message from the partner SMC entity, an error indication is passed to SM-RL, an MM-connection release request, without indication of release cause, is passed to the MM-sublayer, and the SMC entity enters the Idle state.

In the case of a lower layer release, the SMC entity passes an MNSMS-ERROR Indication to SM-RL and then enters the Idle state.

In all cases, if the timer TC1* is running, it is reset.

It is possible that the CP-ACK of a short message transfer might not be received (e.g. due to hand over). If the first CP-ACK (acknowledging the CP-DATA that carried the first RPDU) is not received the reception of CP-DATA may be interpreted as the reception of the awaited CP-ACK and CP-DATA message.

5.4 Concatenating short message or notification transfers

If an entity has more than one short message or notification to send, then it is useful to maintain the Radio Resource (RR) connection in between transfers for circuit switched service. For mobile terminated short messages this is simple because the network decides when, and whether, to release the RR connection. However, for mobile originated transfers, the network does not know whether or not the mobile has more messages to transfer.

If another short message or a memory available notification is to be sent, an originating SMR entity in the MS may choose to continue to use the same RR connection. When the MS chooses to use the same RR connection, then:

- the MS shall transmit a CM SERVICE REQUEST for the new CM connection before the final CP-ACK (e.g. the one that acknowledges the CP-DATA that carried the RP-ACK) for the old MM connection is transmitted;

- before transmission of the first CP-DATA on the new MM connection, the MS shall transmit the CP-ACK for the old MM connection;

- the Transaction Identifier used on the new MM connection shall be different to that used on the old MM connection; and

- the MS shall not initiate establishment of the new MM connection before the final CP-DATA (e.g. the one carrying the RP-ACK) has been received.

NOTE: When an MS sends successive memory available notifications and/or mobile originated short messages on different RR connections, the MS is strongly recommended to use different Transaction Identifiers for the old and new MM connections.

It is possible that the final CP-ACK of a short message transfer may not be received (e.g. due to transmission errors and/or hand overs). For mobile terminated transfers, if the CP-ACK is lost, the reception of a CP-DATA with a different transaction identifier and carrying an RPDU shall be interpreted as the implicit reception of the awaited CP-ACK followed by the reception of the new CP-DATA message. For mobile originated transfers, if the CP-ACK is lost, the reception of a CM SERVICE REQUEST followed by a CP-DATA with a different transaction identifier and carrying an RPDU shall be interpreted as the implicit reception of the awaited CP-ACK followed by the reception of the new CP-DATA message.

6 SM-RL-procedures

6.1 General

This clause describes the procedures used by the SMR entity for short message and notification support on the Short Message Relay Layer. An SMR entity communicates with a corresponding peer entity using a CM-connection.

Multiple CM-connections may be established at the same time, allowing parallel transactions. There is a functional one to one relation between the SMR entity and the SMC entity of the CM-sublayer. The descriptions of the procedures are related to one single transaction.

The RL-procedures described in this subclause can only be performed if a CM-connection has been established between the mobile station and the network. Detailed SDL-diagrams for short message control on SM-RL are contained in annex D.

6.2 Transition states of SMR entity

The state transition diagram for the SMR entities on both MS-side and network side are contained in annex D.

6.2.1 SMR-states at the MS-side of the radio interface

The states described in this subclause are for a SMR entity in a MS, handling mobile originating- and mobile terminating short messages and notification transfer.

6.2.1.1 Idle (State 0)

This state exists when the SMR entity is in idle mode, or when a short message or notification transfer ends in a normal or abnormal way.

6.2.1.2 Wait for RP-ACK (State 1)

This state exists for mobile originating short message or notification transfer when the SMR has passed the RP-DATA or RP-SMMA to the SMC entity and set the timer TR1M.

6.2.1.3 Wait for RETRANS TIMER (State 4)

This state exists for memory available notification when the SMR is waiting to retransmit the RP-SMMA message. Timer TRAM has been set. The possibility of an abort of the sending of the memory available notification by the SM-TL exists. No underlying connection exists.

6.2.2 SMR-states at the network side of the radio interface

The states described in this subclause are for a SMR entity in a MSC, handling mobile originating- and mobile terminating short message and notification transfer.

6.2.2.1 Idle (State 0)

This state exists when the SMR entity is in idle mode, or when a short message transfer or notification end in a normal or abnormal way.

6.2.2.2 Wait for RP-ACK (State 1)

This state exists for a mobile terminating short message transfer when the SMR has passed the RP-DATA message to the SMC entity and set the timer TR1N.

6.2.2.3 Wait to send RP-ACK (State 3)

The SMR entity will enter this state after passing a received RP-DATA or RP-SMMA message to RL and setting the timer TR2N.

6.3 Short Message Relay procedures

The procedures needed for short message and notification relaying are:

- TP Data Unit (TPDU) relay procedures;
- notification relay procedures;
- procedures for abnormal cases.

6.3.1 TPDU relaying

When the SMR entity is in the Idle state and receives a request from SM-TL to relay a TPDU, it forms and transfers the RP-DATA message (containing the TPDU), sets the timer TR1* and enters the state Wait for RP-ACK.

Retransmission of RP data units by the CM-sublayer is described in clause 5.

When the SMR entity is in the "Wait for RP-ACK" state, the following situations may occur:

a) reception of an RP-ACK or RP-ERROR message (containing the same reference number as the transmitted RP-DATA message);

b) reception of an error indication from the CM-sublayer;

c) the timer TR1* expires.

In case a) or b), the timer TR1* is reset, a report indication is passed to SM-TL, a request to release the CM-connection is passed to CM-sublayer, and the SMR entity enters the Idle state.

In case c), a request to abort the CM-connection is passed to the CM-sublayer, a report indication is passed to SM-TL, and the SMR entity enters the Idle state.

When the SMR entity is in the Idle state and receives an MNSMS-EST-Ind containing a valid RP-DATA message, it passes the SMS-TPDU to the SM-TL, starts timer TR2*, and enters the state "Wait to Send RP-ACK".

When the SMR entity is in the state "Wait to Send RP-ACK" and the SMR entity receives the SM-RL-Report-Request, the timer TR2* is reset, the RP-message (RP-ACK or RP-ERROR) is generated and relayed to the peer entity, a CM-connection release request is passed to the CM-sublayer, and the SMR entity enters the Idle state.

When the SMR entity is in the state "Wait to Send RP-ACK" and the SMR entity receives an error indication from the CM-sublayer, the timer TR2* is reset, a report indication is passed to the SM-TL and the SMR entity enters the Idle state.

When the SMR entity is in the state "Wait to send RP-ACK" and the timer TR2* expires, the SMR entity passes a CM-connection abort request to the CM-sublayer, a report indication is passed to the SM-TL, and the SMR entity enters the Idle state.

6.3.2 [spare]

6.3.3 Notification relaying

6.3.3.1 MS side

6.3.3.1.1 Idle state

When the SMR entity in the MS in the Idle state receives a request from the SM-TL to relay a notification to the network, it forms and transfers the RP-SMMA message, starts timer TR1M, and enters the state Wait for RP-ACK.

6.3.3.1.2 Wait for RP-ACK state

When the SMR entity in the MS is in the Wait for RP-ACK state and it receives either:

- an RP-ACK (containing the same reference number as the last transmitted RP-SMMA message); or
- an RP-ERROR (containing the same reference number as the last transmitted RP-SMMA message) with a permanent failure indication; or
- an error indication from the CP-sublayer;

then the MS shall reset timer TR1M, pass a report indication to SM-TL, give a CM-connection release request to the CM-sublayer, and enter the Idle state. If set, timer TRAM and the RETRANS flag are also reset.

When the SMR entity in the MS is in the Wait for RP-ACK state and either:

- it receives an RP-ERROR (containing the same reference number as the last transmitted RP-SMMA message) with a temporary failure indication; or
- timer TR1M expires;

then the MS shall examine the RETRANS flag:

- if the RETRANS flag is set (i.e. no more transmissions of the RP-SMMA message are permitted) then:
  - the MS shall pass a report indication to SM-TL, give a CM-connection release request to the CM-sublayer, reset the RETRANS flag, reset TR1M, and enter the Idle state.
- If the RETRANS flag is not set (i.e. at least another transmission of the RP-SMMA message is currently permitted) then:
  - the MS shall give a CM-connection release request to the CM-sublayer, set the RETRANS flag, reset TR1M, start timer TRAM and enter the Wait for Retrans Timer state.

When the SMR entity in the MS is in the Wait for RP-ACK state and it receives an SM-RL-MEMORY-AVAILABLE-Req (SMS-MEM-NOTIF-ABORT) primitive, then the MS shall set the RETRANS flag and reenter the Wait for RP-ACK state.

6.3.3.1.3 Wait for RETRANS Timer state

When the SMR entity in the MS is in the Wait for Retrans Timer state and timer TRAM expires then, the MS shall form and transfer an RP-SMMA message, start timer TR1M, and enter the state Wait for RP-ACK. The RP-Message Reference in this RP-SMMA message shall be different from that in the previous RP-SMMA message.

When the SMR entity in the MS is in the Wait for Retrans Timer state and it receives an SM-RL-MEMORY-AVAILABLE-Req (SMS-MEM-NOTIF-ABORT) primitive, then the MS shall reset the RETRANS flag, reset timer TRAM, pass a report indication to SM-TL, and enter the Idle state.

6.3.3.2 Network side

6.3.3.2.1 Idle state

When the SMR entity in the network is in the Idle state and receives an MNSMS-EST-Ind containing a valid RP-SMMA message, it passes the SMS-TPDU to the SM-TL, starts timer TR2N, and enters the state "Wait to send RP-ACK".

6.3.3.2.2 Wait to Send RP-ACK state

When the SMR entity in the network is in the state "Wait to Send RP-ACK" and the SMR entity receives the SM-RL-Report-Request, timer TR2N is reset, the RP-message (RP-ACK or RP-ERROR) is generated and relayed to the MS, a CM-connection release request is passed to the CM-sublayer, and the SMR entity enters the Idle state.

When the SMR entity in the network is in the state "Wait to Send RP-ACK" and the SMR entity receives an error indication from the CM-sublayer, timer TR2N is reset, a report indication is passed to the SM-TL and the SMR entity enters the Idle state.

When the SMR entity in the network is in the state "Wait to Send RP-ACK" and the timer TR2N expires, the SMR entity passes a CM-connection abort request to the CM-sublayer, a report indication is passed to the SM-TL, and the SMR entity enters the Idle state.

6.3.4 Abnormal cases

Format errors etc.:

> If the SMR entity upon receipt of an RP-DATA or RP-SMMA message detects an erroneous condition which it can act on, (e.g. format errors, invalid parameters etc.) it shall return an RP-ERROR message with an appropriate cause value and possibly extended diagnostic information, release or abort the CM-connection, and enter the Idle state.

7 Message functional definitions and content

7.1 General

The notation used is as used in ~~GSM 04.08~~TS 24.008/clause 9, and each definition includes:

a) A brief description of the message direction and use.

b) A table listing the information elements in the order of their appearance in the message. For each information element the table indicates:

   1) A reference to the (sub)clause/Technical Specification describing the information element.

   2) The presence requirement indication (M, C, or O) for the IE as defined in ~~GSM 04.07~~TS 24.007.

   3) The format of the information element (T, V, TV, LV, TLV) as defined in ~~GSM 04.07~~TS 24.007.

   4) The length of the information element (or permissible range of lengths), in octets, in the messages.

7.2 Messages for short message or notification transfer on CM

This subclause describes the functional definition and content of the messages sent between two SMC entities.

There are three messages defined: CP-DATA, CP-ACK and CP-ERROR.

7.2.1 CP-DATA

The CP-DATA message is sent between an MSC and an MS, in both directions. The message contains the user data to be relayed between the CM-users, and associated parameters. See table 7.1/ TS 24.011.

Table 7.1/TS 24.011: CP-DATA message content

	Information element	Reference	Presence	Format	Length
	Protocol discriminator	~~GSM 04.07~~TS 24.007	M	V	1/2 octet
	Transaction identifier	~~GSM 04.07~~TS 24.007	M	V	1/2 octet
	Message type	Subclause 8.1.3	M	V	1 octet
	CP-User data	Subclause 8.1.4.1	M	LV	≤ 249 octets

7.2.2 CP-ACK

The CP-ACK message is sent between an MSC and an MS, in both directions, and is used to acknowledge the reception of a CP-DATA message.

See table 7.2/TS 24.011.

Table 7.2/TS 24.011: CP-ACK message content

	Information element	Reference	Presence	Format	Length
	Protocol discriminator	~~GSM 04.07~~TS 24.007	M	V	1/2 octet
	Transaction identifier	~~GSM 04.07~~TS 24.007	M	V	1/2 octet
	Message type	Subclause 8.1.3	M	V	1 octet

7.2.3 CP-ERROR

The CP-ERROR message is sent between an MSC and an MS, in both directions, and used to convey error information. See table 7.3/TS 24.011.

Table 7.3/TS 24.011: CP-ERROR message content

	Information element	Reference	Presence	Format	Length
	Protocol discriminator	GSM 04.07	M	V	1/2 octet
	Transaction identifier	GSM 04.07	M	V	1/2 octet
	Message type	Subclause 8.1.3	M	V	1 octet
	CP-Cause	Subclause 8.1.4.2	M	V	1 octet

7.3 Messages for short message and notification transfer on SM-RL

This subclause describes the functional definition and content of the messages sent between two SMR entities.

There are 4 messages defined: RP-DATA, RP-SMMA, RP-ACK and RP-ERROR.

7.3.1 RP-DATA

A phase 2 entity shall not reject a RP-DATA message where both address elements have a length greater than 0.

7.3.1.1 RP-DATA (Network to Mobile Station)

This message is sent in MSC -> MS direction. The message is used to relay the TPDUs. The information elements are in line with ~~GSM 03.40~~TS 23.040. See table 7.4/TS 24.011.

Table 7.4/TS 24.011: RP-DATA message content

	Information element	Reference	Presence	Format	Length
	RP-Message Type	Subclause 8.2.2	M	V	3 bits
	RP-Message Reference	Subclause 8.2.3	M	V	1 octet
	RP-Originator Address	Subclause 8.2.5.1	M	LV	1-12 octets
	RP-Destination Address	Subclause 8.2.5.2	M	LV	1 octet
	RP-User Data	Subclause 8.2.5.3	M	LV	≤ 234 octets

7.3.1.2 RP-DATA (Mobile Station to Network)

This message is sent in MS -> MSC direction. The message is used to relay the TPDUs. The information elements are in line with ~~GSM 03.40~~TS 23.040. See table 7.5/TS 24.011.

Table 7.5/TS 24.011: RP-DATA message content

	Information element	Reference	Presence	Format	Length
	RP-Message Type	Subclause 8.2.2	M	V	3 bits
	RP-Message Reference	Subclause 8.2.3	M	V	1 octet
	RP-Originator Address	Subclause 8.2.5.1	M	LV	1 octet
	RP-Destination Address	Subclause 8.2.5.2	M	LV	1-12 octets
	RP-User Data	Subclause 8.2.5.3	M	LV	≤ 234 octets

7.3.2 RP-SMMA

This message is sent by the mobile station to relay a notification to the network that the mobile has memory available to receive one or more short messages. The information elements are in line with ~~GSM 03.40~~TS 23.040. See table 7.6/TS 24.011.

Table 7.6/TS 24.011: RP-SMMA message content

	Information element	Reference	Presence	Format	Length
	RP-Message Type	Subclause 8.2.2	M	V	3 bits
	RP-Message Reference	Subclause 8.2.3	M	V	1 octet

7.3.3 RP-ACK

This message is sent between the MSC and the mobile station in both directions and used to relay the acknowledgement of a RP-DATA or RP-SMMA message reception. The information elements are in line with ~~GSM 03.40~~TS 23.040. See table 7.7/TS 24.011.

Table 7.7/TS 24.011: RP-ACK message content

IEI	Information element	Reference	Presence	Format	Length
	RP-Message Type	Subclause 8.2.2	M	V	3 bits
	RP-Message Reference	Subclause 8.2.3	M	V	1 octet
41	RP-User Data	Subclause 8.2.5.3	O	TLV	≤ 240 octets

7.3.4 RP-ERROR

This message is sent between the MSC and the mobile station in both directions and used to relay an error cause from an erroneous short message or notification transfer attempt. The information elements are in line with ~~GSM 03.40~~TS 23.040. See table 7.8/TS 24.011.

The contents of the cause field are given in subclause 8.2.5.4.

Table 7.8/TS 24.011: RP-ERROR message content

IEI	Information element	Reference	Presence	Format	Length
	RP-Message Type	Subclause 8.2.2	M	V	3 bits
	RP-Message Reference	Subclause 8.2.3	M	V	1 octet
	RP-Cause	Subclause 8.2.5.4	M	LV	2-3 octets
41	RP-User Data	Subclause 8.2.5.3	O	TLV	≤ 240 octets

8 Message format and information elements coding

8.1 CP-messages

8.1.1 General

The message format and information elements coding is in line with ~~GSM 04.07~~TS 24.007 and ~~GSM 04.08~~TS 24.008.

The message shall consist of the following parts:

a) protocol discriminator;

b) transaction identifier;

c) message type;

d) other required information elements.

This organization is illustrated in the example shown in figure 8.1/~~04.11~~TS 24.011

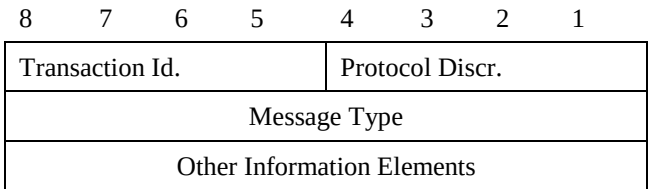


Figure 8.1/TS 24.011

8.1.2 Protocol Discriminator and Transaction Identifier

The Protocol Discriminator and Transaction Identifier is described in ~~GSM 04.07~~TS 24.007.

8.1.3 Message type

The purpose of the message type, together with the protocol discriminator, is to identify the function of the message being sent. The coding of message types is shown in table 8.1/TS 24.011.

Table 8.1/TS 24.011: Message types for short message and notification transfer on CM

8	7	6	5	4	3	2	1	
0	0	0	0	0	0	0	1	CP-DATA
0	0	0	0	0	1	0	0	CP-ACK
0	0	0	1	0	0	0	0	CP-ERROR

8.1.4 Other required information elements

8.1.4.1 CP-User data element

The CP-User data element is used to carry the RPDU. It has an information element identifier, a length indicator and a data field. The data field will contain the RPDUs. The maximum length of the data field is 255 octets. The layout is indicated in figure 8.2/TS 24.011.

8	7	6	5	4	3	2	1	
	0	0	0	0	0	0	1	
0	CP-User Data IEI							1 octet
Length indicator								1 octet
RPDU Maximum length 248 octets								? octet

Figure 8.2/TS 24.011: CP-User data element layout

8.1.4.2 CP-Cause element

This element is included in the CP-ERROR message, the layout is given in figure 8.3/TS 24.011. The error causes are listed in table 8.2/TS 24.011.

8	7	6	5	4	3	2	1	
	0	0	0	0	0	1	0	
0	CP-Cause IEI							1 octet
0	Cause value							1 octet

Figure 8.3/TS 24.011: CP-Cause element layout

Table 8.2/TS 24.011: Content and coding of CP-Cause

Cause value	Cause nr.	Cause
7 6 5 4 3 2 1	#	
0 0 1 0 0 0 1	17	Network failure
0 0 1 0 1 1 0	22	Congestion
1 0 1 0 0 0 1	81	Invalid Transaction Identifier value
1 0 1 1 1 1 1	95	Semantically incorrect message
1 1 0 0 0 0 0	96	Invalid mandatory information
1 1 0 0 0 0 1	97	Message type non-existent or not implemented
1 1 0 0 0 1 0	98	Message not compatible with the short message protocol state
1 1 0 0 0 1 1	99	Information element non-existent or not implemented
1 1 0 1 1 1 1	111	Protocol error, unspecified

All other cause values shall be treated as cause number 111.

8.2 RP-messages

8.2.1 General

The message shall consist of the following parts:

a) message type indicator;

b) message reference;

c) other required information elements.

This organization is illustrated in the example shown in figure 8.4/TS 24.011:

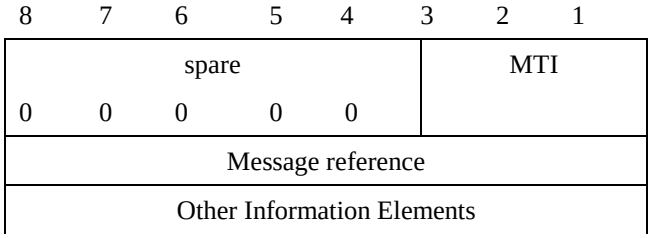


Figure 8.4/TS 24.011

8.2.2 Message type indicator (MTI)

The message type indicator, MTI, is a 3-bit field, located in the first octet of all RP-messages. The coding of the MTI is defined by table 8.3/TS 24.011.

Table 8.3/TS 24.011: Coding of Message Type Indicator

Bit value 3 2 1	Direction	RP-Message
0 0 0	ms -> n	RP-DATA
0 0 0	n -> ms	Reserved
0 0 1	ms -> n	Reserved
0 0 1	n -> ms	RP-DATA
0 1 0	ms -> n	RP-ACK
0 1 0	n -> ms	Reserved
0 1 1	ms -> n	Reserved
0 1 1	n -> ms	RP-ACK
1 0 0	ms -> n	RP-ERROR
1 0 0	n -> ms	Reserved
1 0 1	ms -> n	Reserved
1 0 1	n -> ms	RP-ERROR
1 1 0	ms -> n	RP-SMMA
1 1 0	n -> ms	Reserved
1 1 1	ms -> n	Reserved
1 1 1	n -> ms	Reserved

8.2.3 Message reference

The message reference field contains a sequence number in the range 0 through 255, and is used to link an RP-ACK message or RP-ERROR message to the associated (preceding) RP-DATA or RP-SMMA message transfer attempt.

8.2.4 [Spare]

8.2.5 Other required information elements

8.2.5.1 Originator address element

In the case of MT transfer this element contains the originating Service Centre address.

The RP-Originator Address information element is coded as shown in figure 8.5/TS 24.011.

The RP-Originator Address is a type 4 information element. In the network to mobile station direction the minimum value of the length octet is 2 and the maximum value is 11. In the mobile station to network direction the value of the length octet of the element is set to 0.

8	7	6	5	4	3	2	1	
	RP-Originator Address IEI							octet 1
Length of RP-Originator Address contents								octet 2
1 ext	type of number			Numbering plan identification				octet 3
Number digit 2				Number digit 1				octet 4
Number digit 4				Number digit 3				octet 5
								:
								:

Figure 8.5/TS 24.011: RP-Originator Address information element

If the RP-Originator Address contains an odd number of digits, bits 5 to 8 of the last octet shall be filled with an end mark coded as "1111".

The contents of octets 3, 4, etc. are the same as those defined for the Called Party BCD Number IE defined in GSM 04.08.

8.2.5.2 Destination address element

In the case of MO transfer, this element contains the destination Service Centre address.

The RP-Destination Address information element is coded as shown in figure 8.6/TS 24.011.

The RP-Destination Address is a type 4 information element. In the mobile station to network direction the minimum value of the length octet is 2 and the maximum value is 11. In the network to mobile station direction, the value of the length octet of the element is set to 0.

8	7	6	5	4	3	2	1	
	RP-Destination Address number IEI							octet 1
Length of RP-Destination Address contents								octet 2
1 ext	type of number			Numbering plan identification				octet 3
Number digit 2				Number digit 1				octet 4
Number digit 4				Number digit 3				octet 5
								:
								:

Figure 8.6/TS 24.011: RP-Destination Address information element

The number digit(s) in octet 4 precede the digit(s) in octet 5 etc. The number digit which would be entered first is located in octet 4, bits 1 to 4.

If the RP-Destination Address 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 contains the complete RP-Destination Address there is no need for an additional complete indication.

The contents of octets 3, 4, etc. are the same as those defined for the Called Party BCD Number IE defined in ~~GSM 04.08~~TS 24.008.

8.2.5.3 RP-User data element

The RP-User data field contains the TPDU and is mandatory in a RP-DATA message. RP-User data is also optionally carried in an RP-Error message. The element has a variable length, up to 239 octets, the first octet sent being a length indicator.

RP-User data in an RP-Error message is conveyed as diagnostic information within the "SM-DeliveryFailureCause" response to a MAP Forward-Short-Message procedure (see ~~GSM 09.02~~TS 29.002). The diagnostic information may be sent in both directions, and shall always be forwarded by the MSC if it is received.

8	7	6	5	4	3	2	1	
	1	0	0	0	0	0	1	
0	RP-User Data IEI							1 octet
Length indicator								1 octet
TPDU Maximum length 233 octets								

Figure 8.7/TS 24.011: RP-User data element layout

8.2.5.4 RP-Cause element

This element is a variable length element always included in the RP-ERROR message, conveying a negative result of a RP-DATA message transfer attempt or RP-SMMA notification attempt. The element contains a cause value and optionally a diagnostic field giving further details of the error cause.

The coding of the cause value is given in table 8.4/TS 24.011. The mapping between error causes in TS 24.011 and ~~GSM 09.02~~TS 29.002 (MAP) is specified in ~~GSM 03.40~~TS 23.040. Parameters included in the return error from MAP (e.g. System Failure) are mapped directly into the diagnostic field.

8	7	6	5	4	3	2	1	
	1	0	0	0	0	1	0	
0	RP-Cause IEI							1 octet
Length indicator								1 octet
0 ext	Cause value							1 octet
	Cause value							
Diagnostic field								1 octet *

Figure 8.8/TS 24.011: RP-Cause element layout

Table 8.4/TS 24.011 (part 1): Cause values that may be contained in an RP-ERROR message in a mobile originating SM-transfer attempt

Cause value	Cause	Cause
Class value	number	
7 6 5 4 3 2 1	#	
0 0 0 0 0 0 1	1	Unassigned (unallocated) number
0 0 0 1 0 0 0	8	Operator determined barring
0 0 0 1 0 1 0	10	Call barred
0 0 0 1 0 1 1	11	Reserved
0 0 1 0 1 0 1	21	Short message transfer rejected
0 0 1 1 0 1 1	27	Destination out of order
0 0 1 1 1 0 0	28	Unidentified subscriber
0 0 1 1 1 0 1	29	Facility rejected
0 0 1 1 1 1 0	30	Unknown subscriber
0 1 0 0 1 1 0	38	Network out of order
0 1 0 1 0 0 1	41	Temporary failure
0 1 0 1 0 1 0	42	Congestion
0 1 0 1 1 1 1	47	Resources unavailable, unspecified
0 1 1 0 0 1 0	50	Requested facility not subscribed
1 0 0 0 1 0 1	69	Requested facility not implemented
1 0 1 0 0 0 1	81	Invalid short message transfer reference value
1 0 1 1 1 1 1	95	Semantically incorrect message
1 1 0 0 0 0 0	96	Invalid mandatory information
1 1 0 0 0 0 1	97	Message type non-existent or not implemented
1 1 0 0 0 1 0	98	Message not compatible with short message protocol state
1 1 0 0 0 1 1	99	Information element non-existent or not implemented
1 1 0 1 1 1 1	111	Protocol error, unspecified
1 1 1 1 1 1 1	127	Interworking, unspecified
All other cause values shall be treated as cause number 41, "Temporary Failure".		

Table 8.4/TS 24.011 (part 2): Cause values that may be contained in an RP-ERROR message in a mobile terminating SM-transfer attempt

Cause value	Cause	Cause
Class value	number	
7 6 5 4 3 2 1	#	
0 0 1 0 1 1 0	22	Memory capacity exceeded
1 0 1 0 0 0 1	81	Invalid short message transfer reference value
1 0 1 1 1 1 1	95	Semantically incorrect message
1 1 0 0 0 0 0	96	Invalid mandatory information
1 1 0 0 0 0 1	97	Message type non-existent or not implemented
1 1 0 0 0 1 0	98	Message not compatible with short message protocol state
1 1 0 0 0 1 1	99	Information element non-existent or not implemented
1 1 0 1 1 1 1	111	Protocol error, unspecified
All other cause values shall be treated as cause number 111, "Protocol error, unspecified".		

Table 8.4/TS 24.011 (part 3): Cause values that may be contained in an RP-ERROR message in a memory available notification attempt

Cause value	Cause	Cause	Cause
Class value	number	type	
7 6 5 4 3 2 1	#		
0 0 1 1 1 1 0	30	P	Unknown Subscriber
0 1 0 0 1 1 0	38	T	Network out of order
0 1 0 1 0 0 1	41	T	Temporary failure
0 1 0 1 0 1 0	42	T	Congestion
0 1 0 1 1 1 1	47	T	Resources unavailable, unspecified
1 0 0 0 1 0 1	69	P	Requested facility not implemented
1 0 1 1 1 1 1	95	P	Semantically incorrect message
1 1 0 0 0 0 0	96	P	Invalid mandatory information
1 1 0 0 0 0 1	97	P	Message type non-existent or not implemented
1 1 0 0 0 1 0	98	P	Message not compatible with short message protocol state
1 1 0 0 0 1 1	99	P	Information element non-existent or not implemented
1 1 0 1 1 1 1	111	P	Protocol error, unspecified
1 1 1 1 1 1 1	127	P	Interworking, unspecified
All other cause values are treated as cause number 41, "Temporary failure".			
Each cause is classified as "Temporary" or "Permanent", as indicated by T and P respectively in the cause type column.			

9 Handling of unknown, unforeseen, and erroneous protocol data

9.1 General

This subclause specifies procedures for 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.

Most error handling procedures are mandatory for the MS but optional for the network. Detailed error handling procedures in the network are implementation dependent and may vary from PLMN to PLMN.

In this subclause the following terminology is used:

- An IE is defined to be syntactically incorrect in a message if it contains at least one value defined as "reserved", or if its value part violates rules. However it is not a syntactical error that a type 4 IE specifies in its length indicator a greater length than defined.

- A message is defined to have semantically incorrect contents if it contains information which, possibly dependant on the state of the receiver, is in contradiction to the resources of the receiver and/or to the procedural part of TS 24.011.

9.2 CP Error Handling

Upon receiving a CP-ERROR message the SMC-CS entity (in any state) shall pass an error indication to SM-RL, pass an MM-connection release request to the MM-sublayer, and enter the Idle State.

After sending a CP-ERROR message the SMC-CS entity (in any state) shall pass an MM-connection release request to the MM sublayer and then enter the Idle State.

Upon receiving a CP-ERROR message the SMC-GP entity (in any state) shall pass an error indication to SM-RL and enter the Idle State.

After sending a CP-ERROR message the SMC-GP entity (in any state) shall enter the Idle State.

9.2.1 Message too short

When a message is received that is too short to contain a complete message type information element, that message shall be ignored, see ~~GSM 04.07~~TS 24.007.

9.2.2 Unknown or unforeseen transaction identifier

The Mobile Station shall ignore a CP message (CP-DATA, CP-ACK, CP-ERROR) received with TI value "111". Whenever a CP-ACK message is received specifying a Transaction Identifier which is not associated with an active SM transfer, the mobile station shall discard the message and return a CP-ERROR message with cause #81, "Invalid Transaction Identifier" using the received Transaction Identifier, if an appropriate connection exists. The Mobile Station shall ignore a CP-ERROR message that is received specifying a Transaction Identifier which is not associated with an active SM transfer. The Mobile Station shall ignore a CP-DATA message that is received specifying a Transaction Identifier which is not associated with an active SM transfer and with transaction identifier flag set to "1".

The same procedures may apply to the network.

9.2.3 Unknown or unforeseen message type

If the Mobile Station receives a message with message type not defined for the PD or not implemented by the receiver, it shall ignore the message and return a CP-ERROR message with cause #97 "message type non-existent or not implemented", if an appropriate connection exists.

NOTE: A message type not defined for the PD in the given direction is regarded by the receiver as a message type not defined for the PD, see ~~GSM 04.07~~TS 24.007.

If the Mobile Station receives a message not consistent with the protocol state, the Mobile Station shall ignore the message and return a CP-ERROR message with cause #98 "Message type not compatible with the short message protocol state", if an appropriate connection exists.

The network may follow the same procedures.

9.2.4 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 is received, the mobile station shall proceed as follows.

When the corresponding SM transfer is not seen as successfully transferred, i.e. the transaction is not completed, the mobile station shall ignore the message and return a CP-ERROR message with cause #96 "invalid mandatory information", if an appropriate connection exists.

When the SM transfer is seen as successfully transferred, the mobile station shall ignore the message and enter the Idle State.

In the case that the message received is a CP-ERROR message, the mobile station shall ignore the message and enter the Idle State.

The network may follow the applicable procedures defined in this subclause.

9.2.5 Messages with semantically incorrect contents

When a message with semantically incorrect contents is received, the foreseen reactions of the procedural part of TS 24.011 are performed. If however no such reactions are specified, the mobile station shall proceed as follows:

- When the corresponding SM transfer is not seen as successfully transferred, the mobile station shall ignore the message and return a CP-ERROR message with cause value #95 "semantically incorrect message", if an appropriate connection exists.
- When the SM transfer is seen as successfully transferred, the mobile station shall ignore the message and enter the Idle State.
- In the case that the message received is a CP-ERROR message, the mobile station shall ignore the message and enter the Idle State.

The network may follow the same procedure.

9.3 RP Error Handling

Upon receiving or sending an RP-ERROR message the SMR entity shall behave as described in the procedural description in clause 6.

9.3.1 Message too short

When a message is received that is too short to contain a complete message type information element and Message Reference, that message shall be ignored.

9.3.2 Unknown or unforeseen Message Reference

Whenever any RP-ACK message is received specifying a Message Reference which is not associated with an active SM transfer, the mobile station shall discard the message and return an RP-ERROR message with cause #81, "Invalid short message transfer reference value" using the received Message Reference, if an appropriate connection exists.

When an RP-ERROR message is received specifying a Message Reference which is not associated with an active SM transfer, the mobile station shall discard the message.

When the mobile station's SMR entity is not in the Idle state, and it receives an RP-DATA message specifying a Message Reference which is not associated with the active SM transfer, then it shall either:

- send an RP-ERROR message with cause #81, "Invalid short message transfer reference value" using the received Message Reference, if an appropriate connection exists; or
- behave as described below for the receipt of an message not consistent with the protocol state.

The same procedures may apply to the network.

9.3.3 Unknown or unforeseen message type

If the Mobile Station receives a RP-message indicating a value of the message type indicator (MTI) defined as reserved, it shall ignore the message and return an RP-ERROR message with cause #97 "message type non-existent or not implemented", if an appropriate connection exists.

If the Mobile Station receives a message (except RP-ERROR) not consistent with the protocol state, the Mobile Station shall ignore the message and return a RP-ERROR message with cause #98 "Message type not compatible with Short Message protocol state", if an appropriate connection exists.

If the Mobile Station receives an RP-ERROR message not consistent with the protocol state, the Mobile Station shall ignore the message.

The network may follow the same procedures.

9.3.4 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 is received, the mobile station shall (except for the case of a reserved value of the MTI as defined above) proceed as follows:

- when the message is an RP-DATA or RP-ACK, the mobile station shall ignore the message and return an RP-ERROR message with cause #96 "invalid mandatory information", if an appropriate connection exists;
- when the message is an RP-ERROR, the mobile station shall treat the message as an RP-ERROR message carrying RP-Cause value 111 without any diagnostic field, and with no RP-User Data.

The network may follow the applicable procedures defined in this subclause.

9.3.5 Messages with semantically incorrect contents

When a message with semantically incorrect contents is received, the foreseen reactions of the procedural part of TS 24.011 are performed. If however no such reactions are specified then:

- if the message was not an RP-ERROR message, the MS shall ignore the message and return an RP-ERROR message with cause value #95 "semantically incorrect message", if an appropriate connection exists; while
- if the message was an RP-ERROR message, the mobile station shall treat the message as an RP-ERROR message carrying RP-Cause value #111 without any diagnostic field, and with no RP-User Data.

The network may follow the same procedure.

10 Timers

The present document places the following requirements on the timers described in this ~~E~~TS:

- timer TR1M shall be greater than 35 seconds and less than 45 seconds;
- the value of timer TRAM shall be greater than 25 seconds and less than 35 seconds;
- timer TR2M shall be greater than 12 seconds and less than 20 seconds.

Annex A (informative): Arrow diagrams

Arrow diagram A1:

The diagram shows CS MO-message transfer by means of interlayer service primitives and the actual messages being transferred between the layer entities

Arrow diagram A2:

The diagram shows CS MT-messaging by means of interlayer service primitives and the actual messages being transferred between the layer entities in GSM.

Arrow diagram A5:

The diagram shows GPRS MO-message transfer by means of interlayer service primitives and the actual messages being transferred between the layer entities.

- MNSMS-primitives indicate services provided by CM to SM-RL.
- LLSMS-primitives indicate services provided by LLC to CM.
- CP-DATA is the CM-message carrying SM-RP data units.
- CP-ACK acknowledge CP-DATA reception on CM.

Arrow diagram A6:

The diagram shows GPRS MT-message transfer by means of interlayer service primitives and the actual messages being transferred between the layer entities in GSM.

- MNSMS-primitives indicate services provided by CM to SM-RL.
- LLSMS-primitives indicate services provided by LLC to CM.
- CP-DATA is the CM-message carrying SM-RP data units.
- CP-ACK acknowledge CP-DATA reception on CM.

Arrow diagram A7:

The diagram shows UMTS PS MO-message transfer by means of interlayer service primitives and the actual messages being transferred between the layer entities

- MNSMS-primitives indicate services provided by CM to SM-RL.
- PMMSMS-primitives indicate services provided by GMM to CM.
- CP-DATA is the CM-message carrying SM-RP data units.
- CP-ACK acknowledge CP-DATA reception on CM.

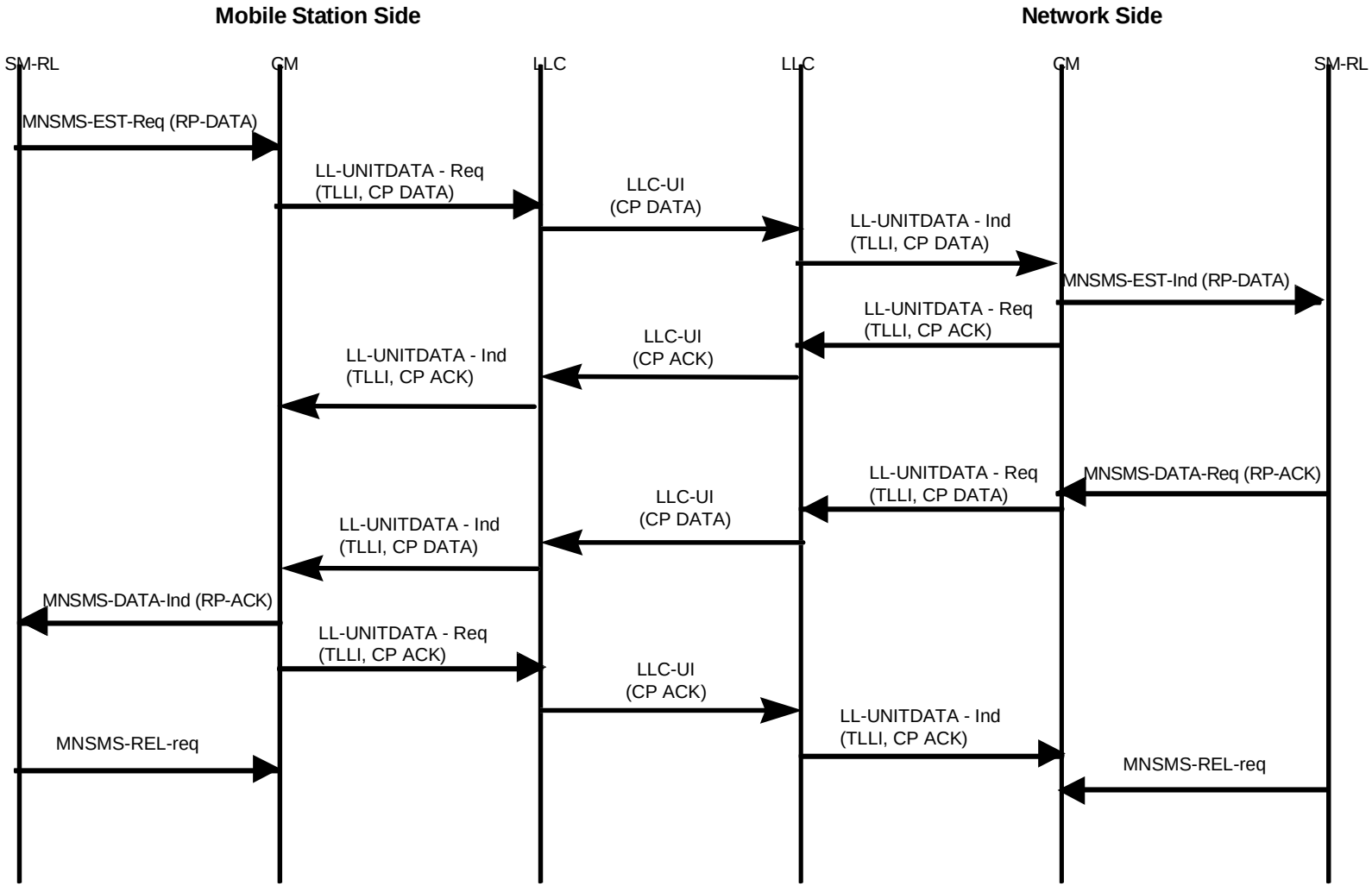
Arrow diagram A8:

The diagram shows UMTS PS MT-messaging by means of interlayer service primitives and the actual messages being transferred between the layer entities

- MNSMS-primitives indicate services provided by CM to SM-RL.
- PMMSMS-primitives indicate services provided by GMM to CM.
- CP-DATA is the CM-message carrying SM-RP data units.

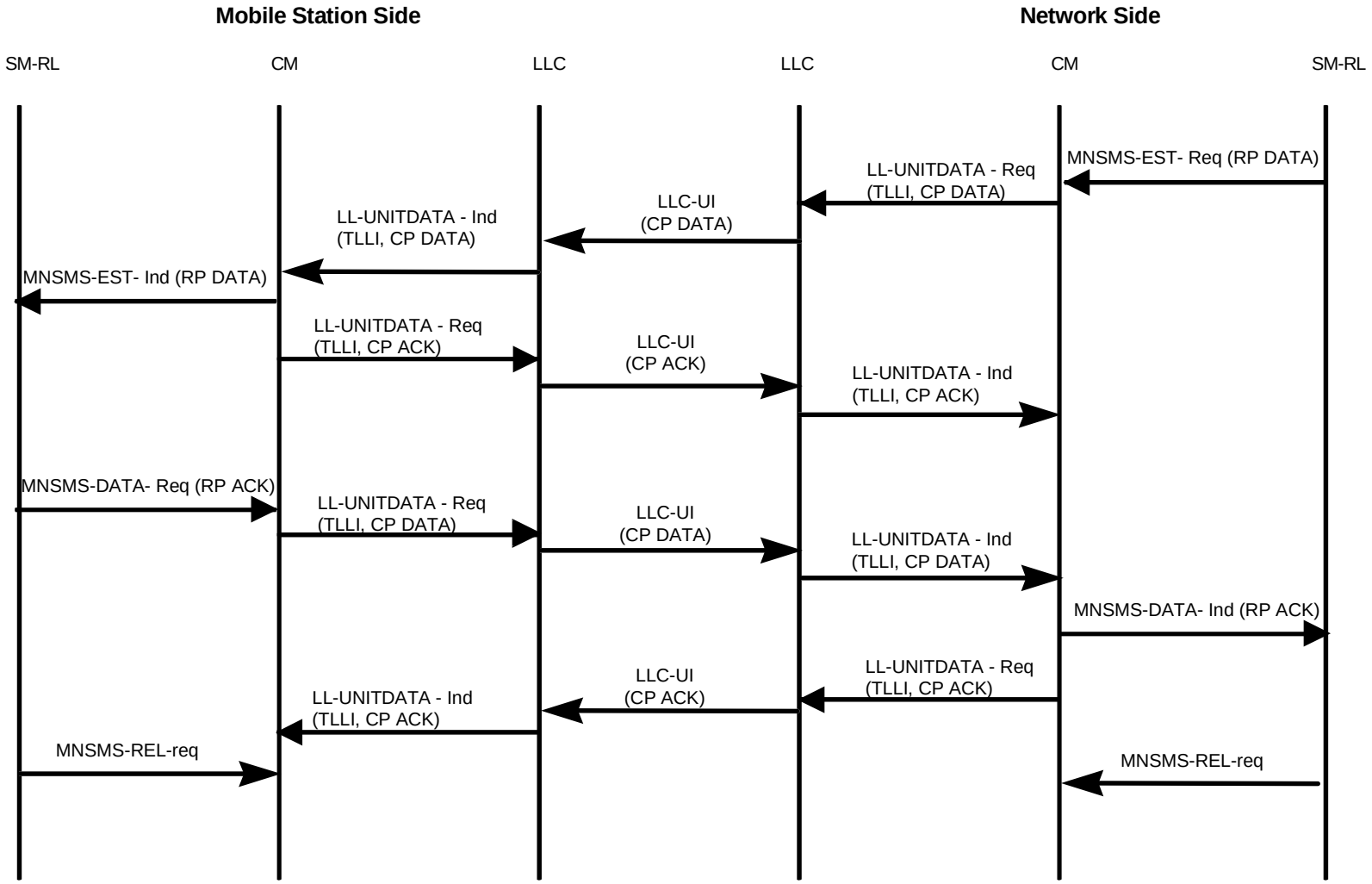
CP-ACK acknowledge CP-DATA reception on CM.

GPRS Mobile Originated Messaging on CM-sublayer in GSM



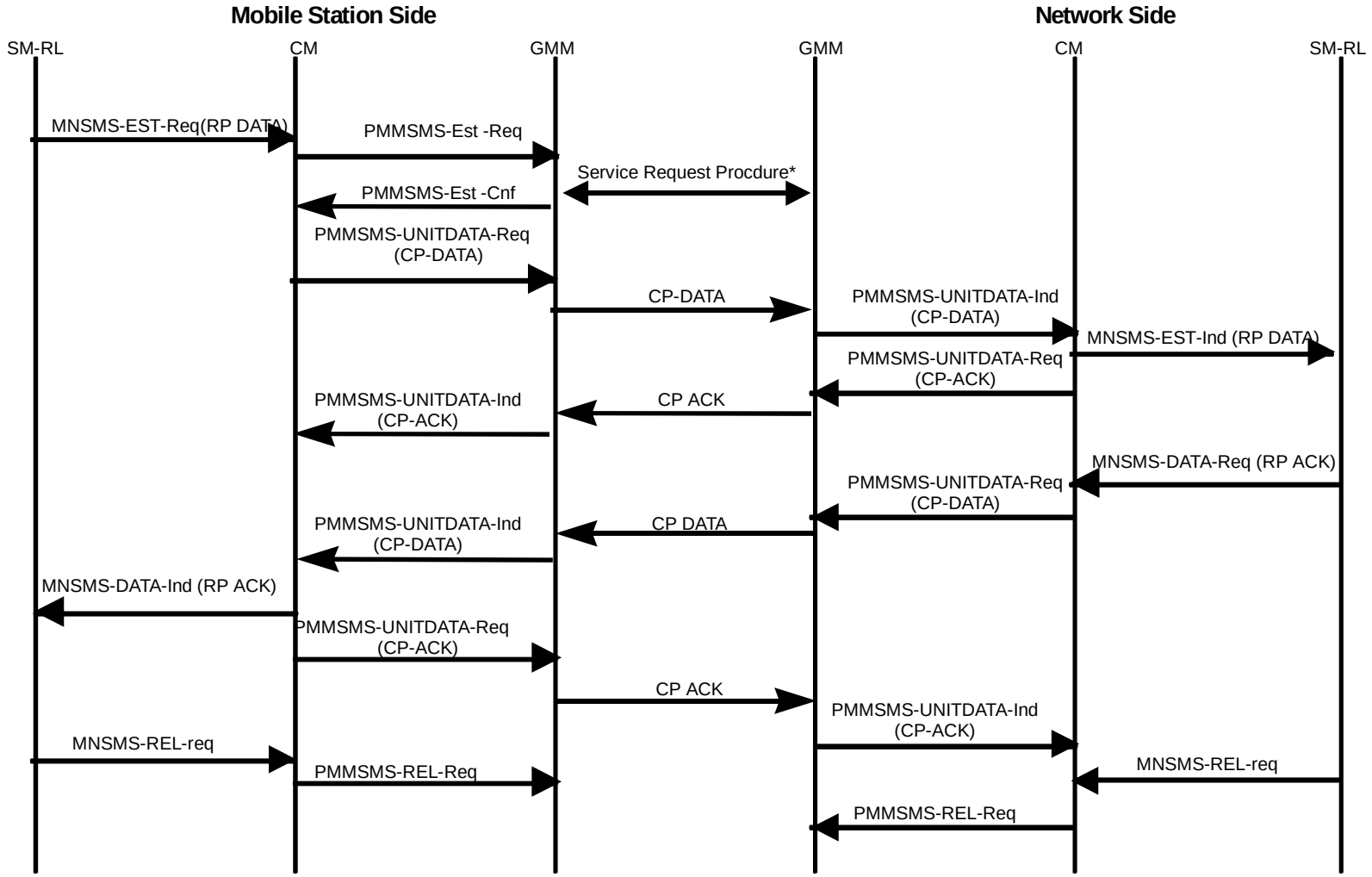
Arrow diagram A5

GPRS Mobile Terminated Messaging on CM-sublayer in GSM



Arrow diagram A6

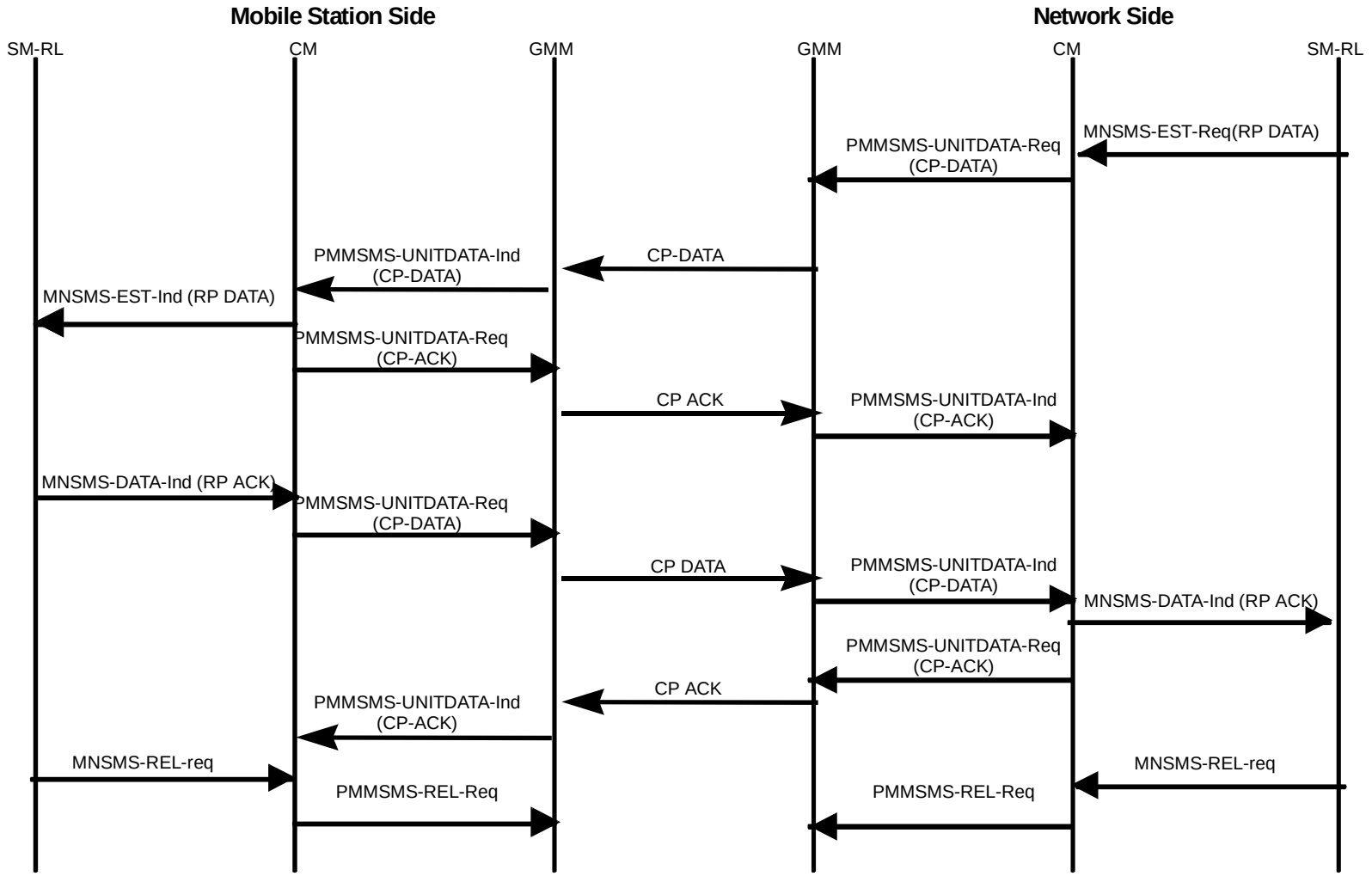
GPRS Mobile Originated Messaging on CM-sublayer in UMTS



Note: Service Request Procedure may not be initiated.

Arrow diagram A7

GPRS Mobile Terminated Messaging on CM-sublayer in UMTS



Arrow diagram A8

Annex B (normative): SDL-description of the CM-layer

B.1 Introduction

This annex contains an SDL-description of the Connection Management Sublayer in terms of the Short Message Service Support. The CM- sublayer provides services to Short Message Relay Layer.

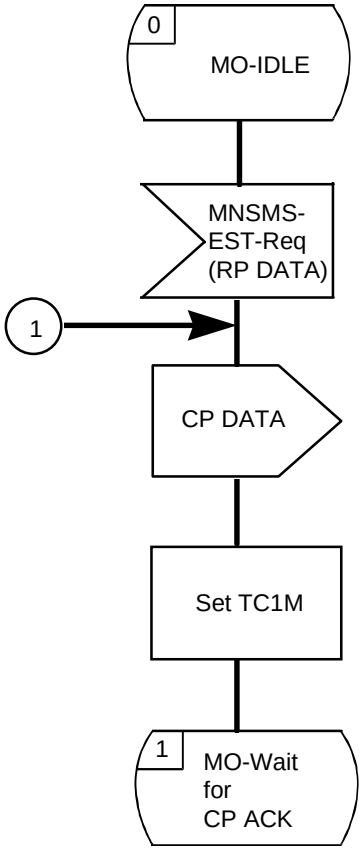
The SDLs contain a mixture of peer to peer messages and conceptual primitives between the layers SM-RL, CM, MM and LLC, as viewed by the SMC entities. SDL-1/2/3 show the CS SMC entity on MS-side for Mobile Originated (MO) short message transfer, SDL-4/5/6 show the CS SMC entity on MS-side for Mobile Terminated (MT) short message transfer, SDL-7/8/9 show the CS SMC entity on the network side for Mobile Originated (MO) short message transfer, and SDL-10/11/12 show the CS SMC entity on the network side for Mobile Terminated (MT) short message transfer.

SDL-13/14/15 show the GPRS SMC entity on MS-side for Mobile Originated (MO) short message transfer, [FFS: These diagrams don't show new UMTS state.]

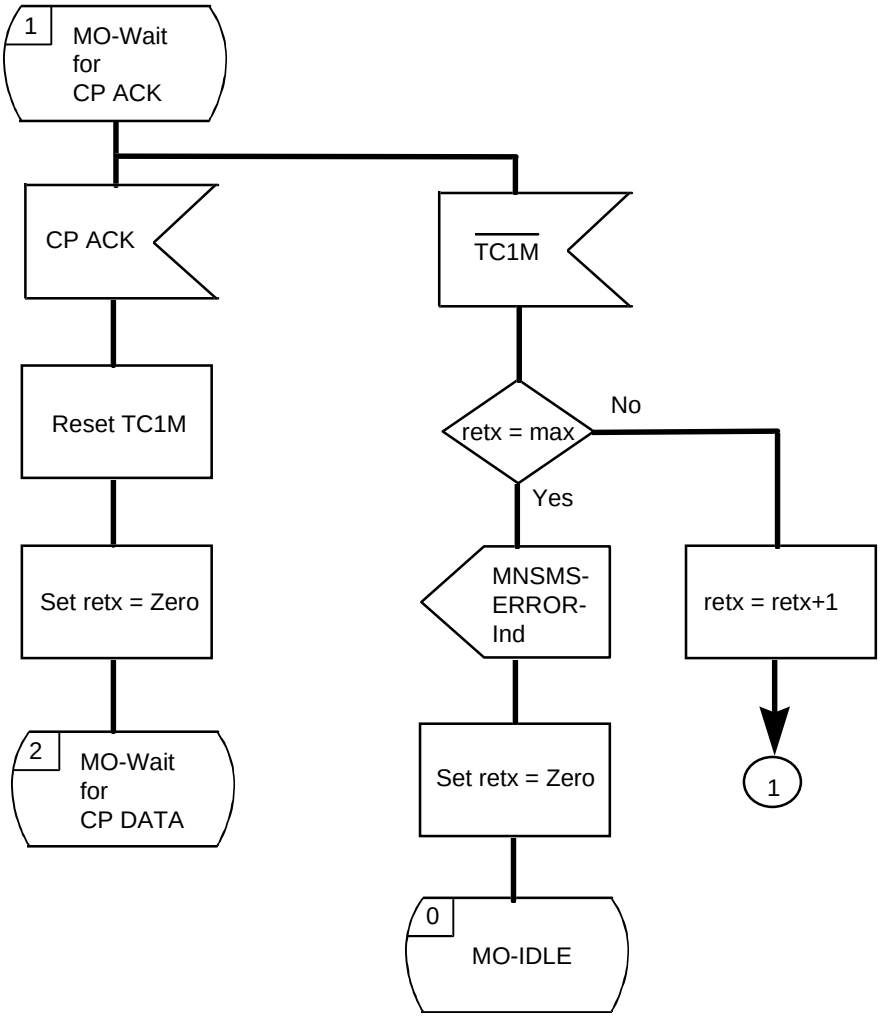
SDL-16/17/18 show the GPRS SMC entity on MS-side for Mobile Terminated (MT) short message transfer, SDL-19/20/21 show the GPRS SMC entity on the network side for Mobile Originated (MO) short message transfer, and SDL-22/23/24 show the GPRS SMC entity on the network side for Mobile Terminated (MT) short message transfer.

The lower layers (below MM, GMM and LLC) are transparent to an SMC entity.

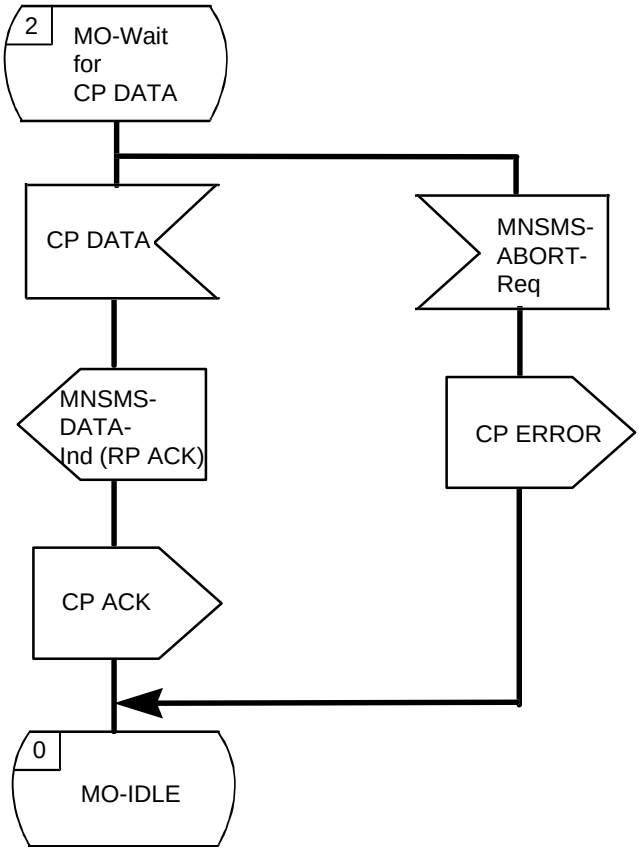
Editors note:- Please Change all the SDL 1-12 titles to include CS GSM



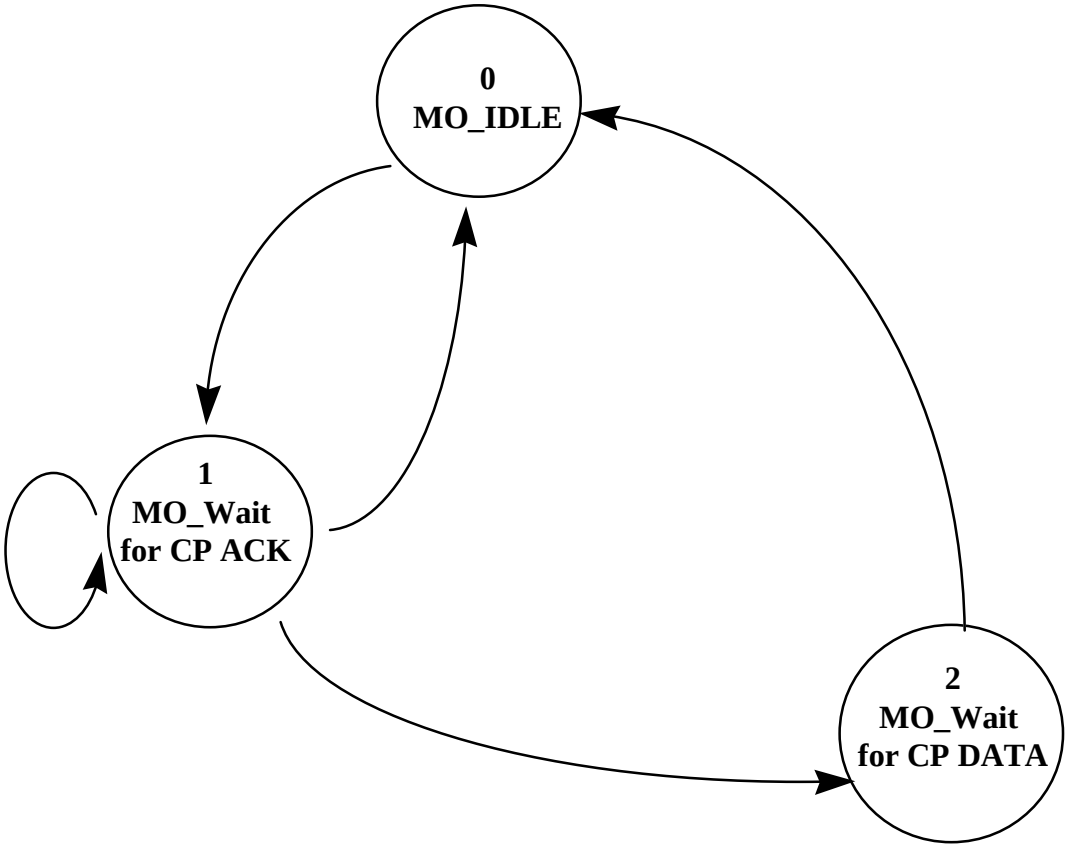
MO-SMC-GP entity on MS-side for GPRS
SDL-13



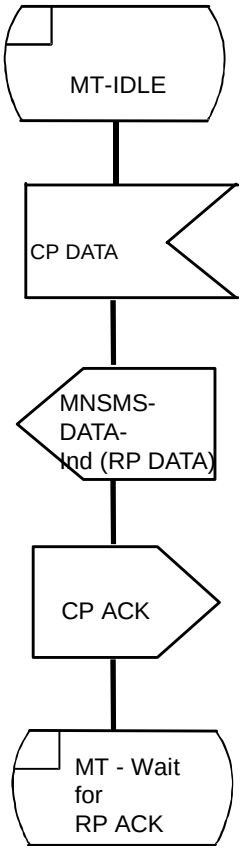
MO-SMC-GP entity on MS-side for GPRS
SDL-14



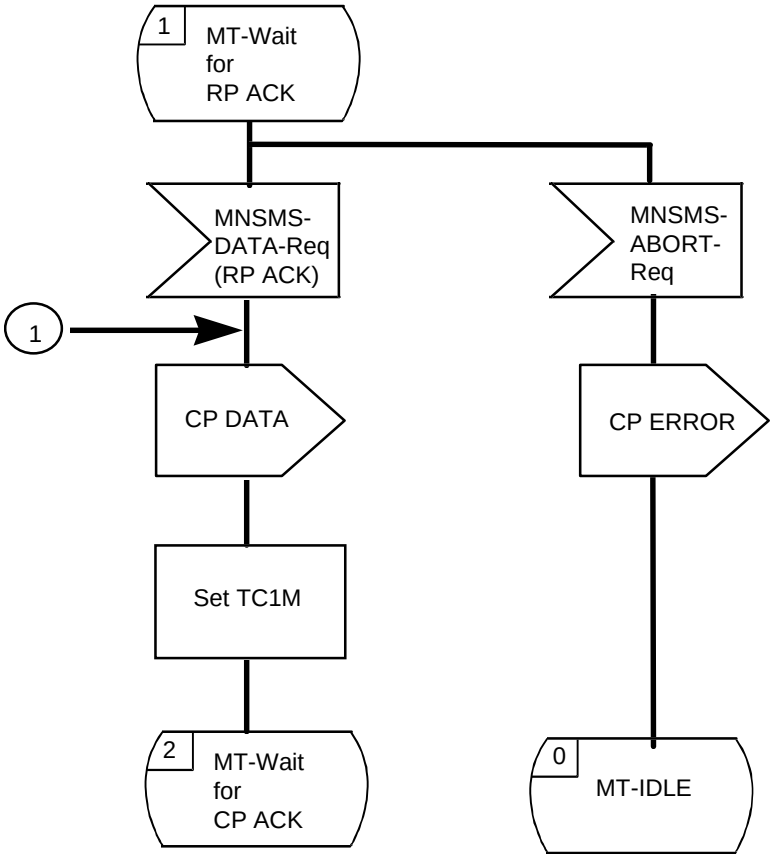
MO-SMC-GP entity on MS-side for GPRS
SDL-15



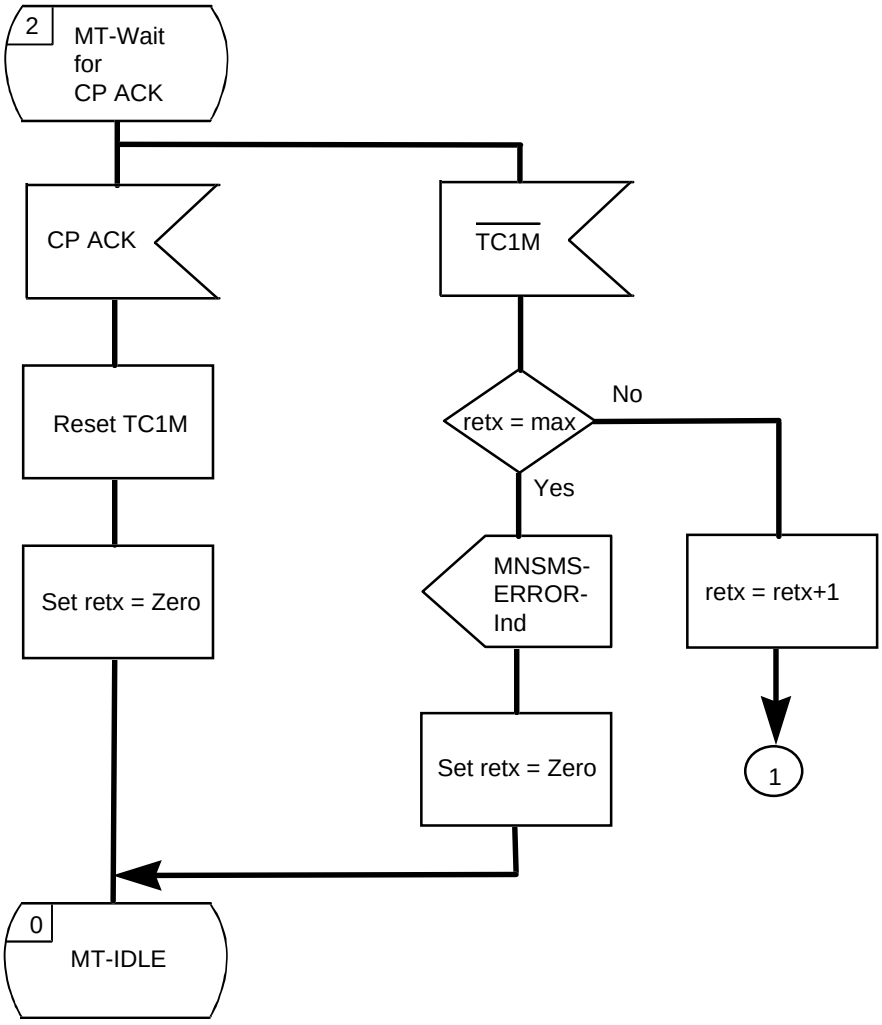
MO-SMC-GP entity on MS-side for GPRS
State transition diagram



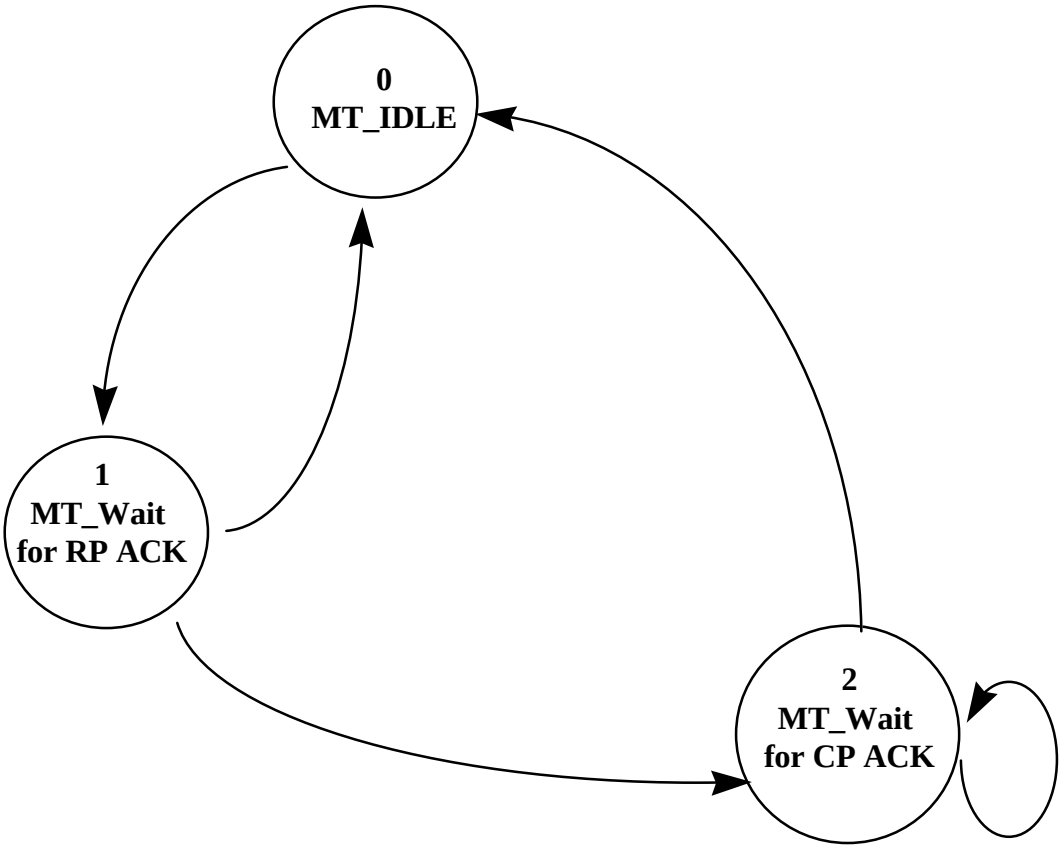
MT-SMC-GP entity on MS-side for GPRS
SDL-16



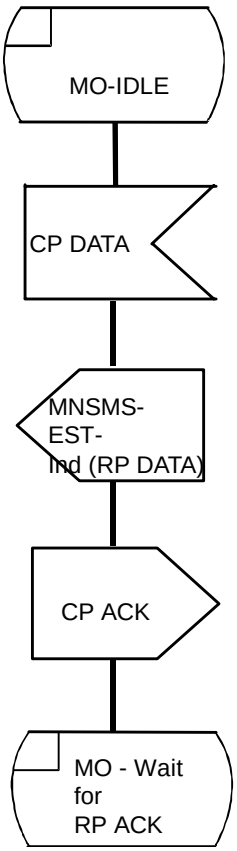
MT-SMC-GP entity on MS-side for GPRS
SDL-17



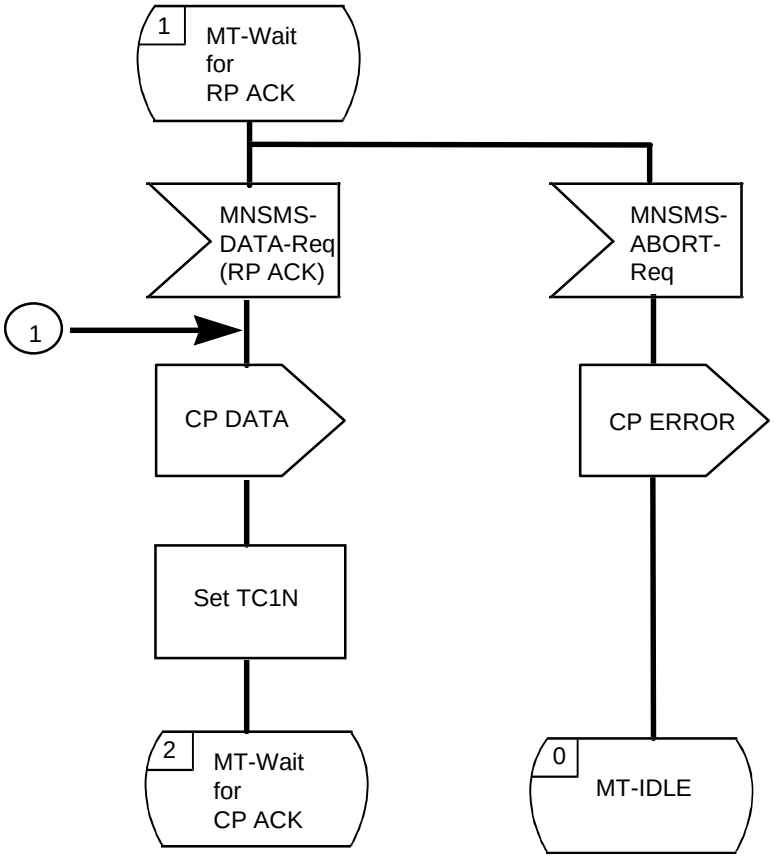
MT-SMC-GP entity on MS-side for GPRS
SDL-18



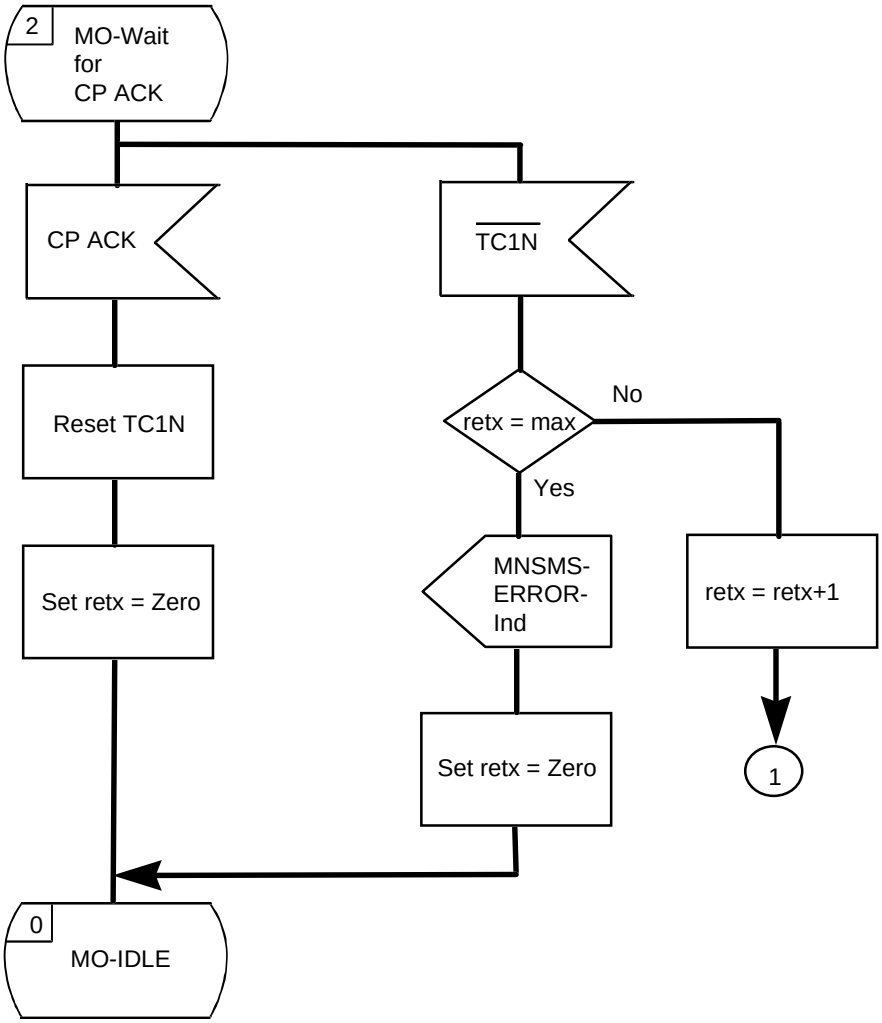
MT-SMC-GP entity on MS-side for GPRS
State transition diagram



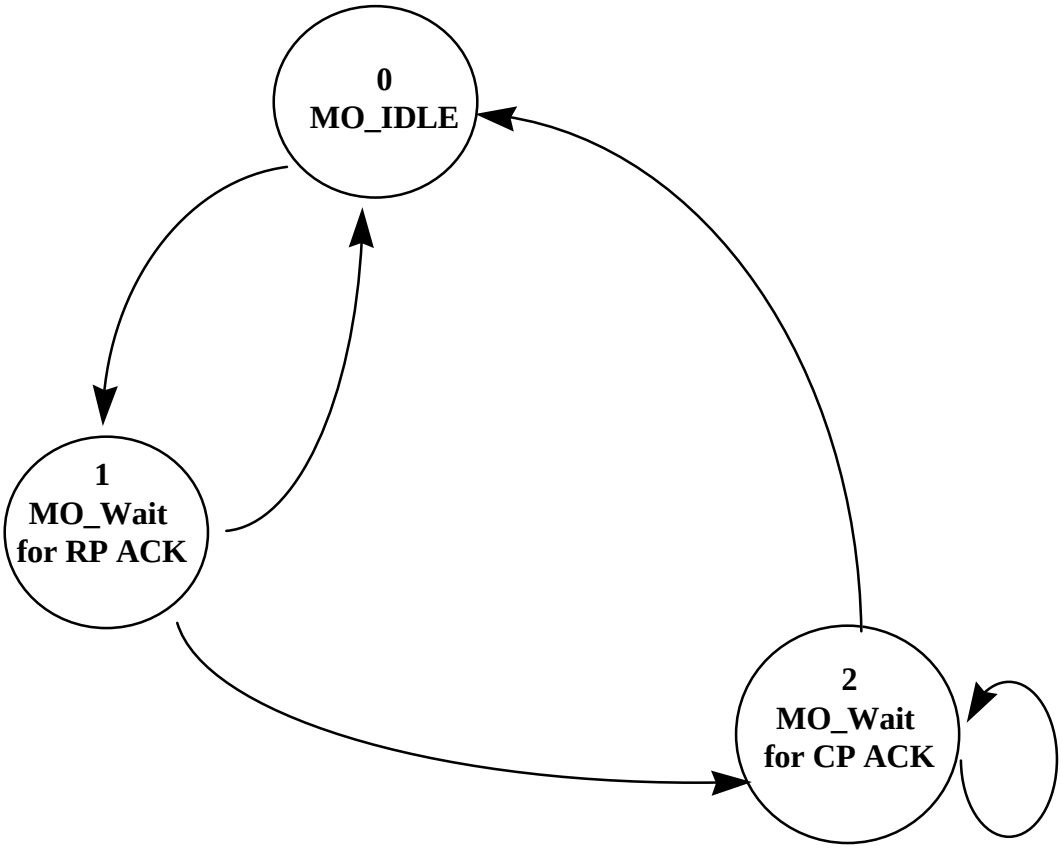
MO-SMC-GP entity on Network side for GPRS
SDL-19



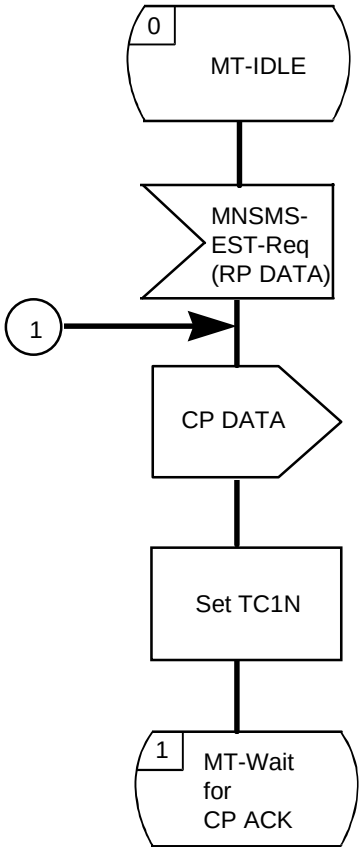
MO-SMC-GP entity on Network side for GPRS
SDL-20



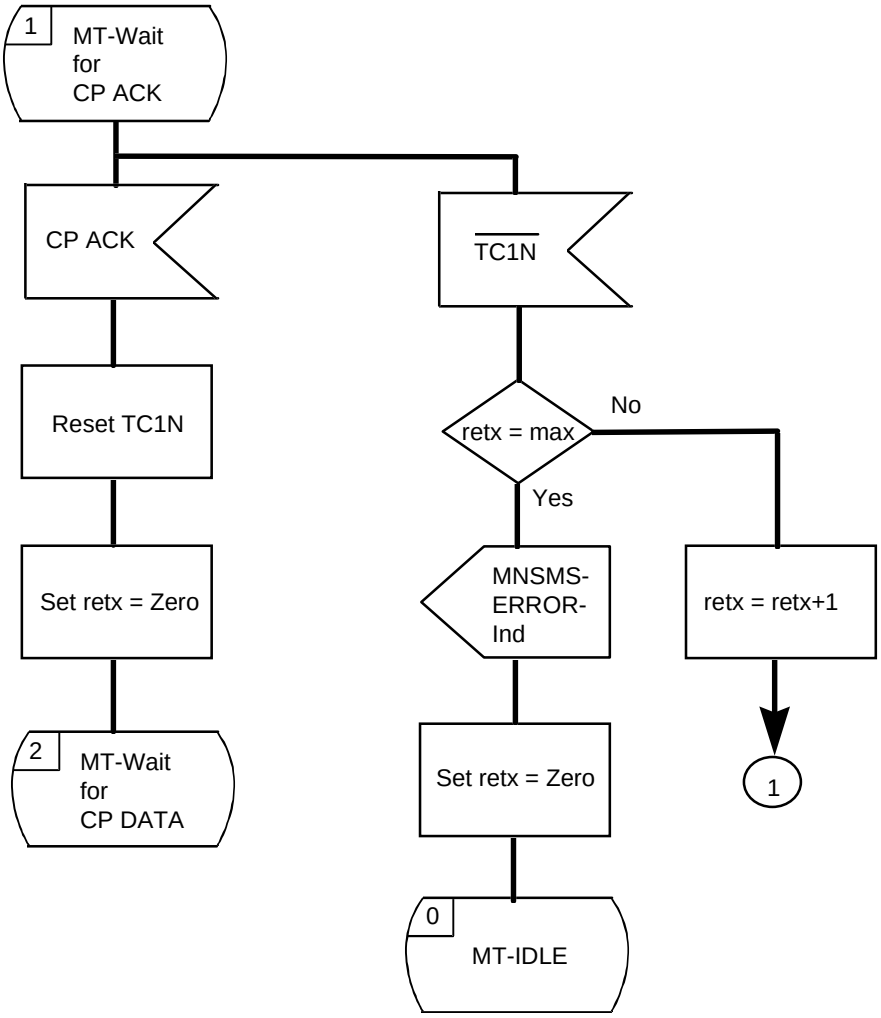
MO-SMC-GP entity on Network side for GPRS
SDL-21



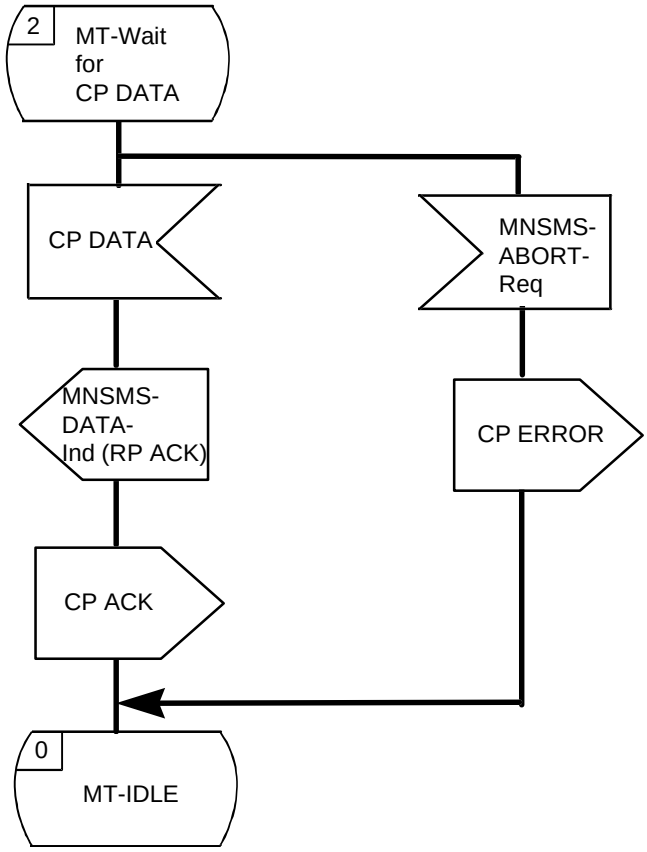
MO-SMC-GP entity on Network-side for GPRS
State transition diagram



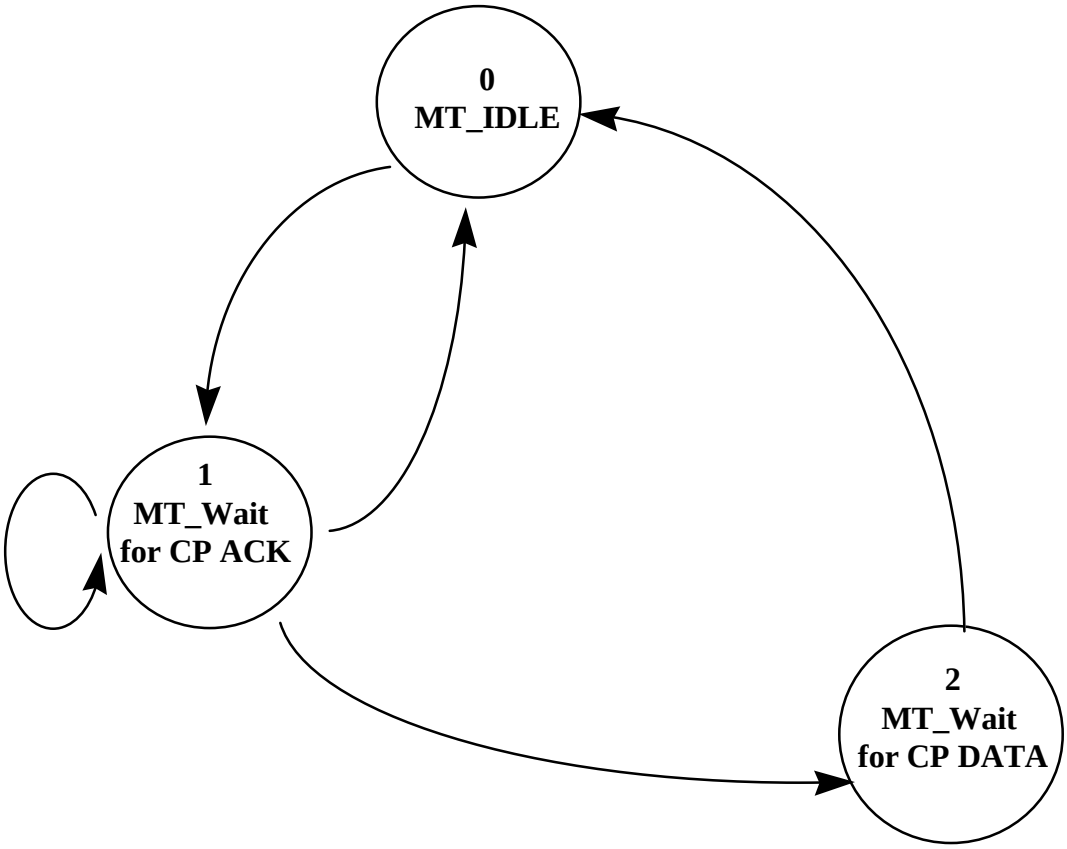
MT-SMC-GP entity on Network-side for GPRS
SDL-22



MT-SMC-GP entity on Network-side for GPRS
SDL-23



MT-SMC-GP entity on Network-side for GPRS SDL-24



MT-SMC-GP entity on Network-side for GPRS
State transition diagram

Annex C (informative): Arrow diagrams

Arrow diagram C1:

The diagram reflects MO-message transfer by means of interlayer service primitives and the actual messages being transferred between the layer entities.

- SM-RL-primitives indicate services provided by SM-RL to SM-TL and RL (* see note).
- MNSMS-primitives indicate services provided by CM to SM-RL.
- RP-DATA is the SM-RL message carrying SM-TP data units.
- RP-ACK acknowledges RP-DATA reception on SM-RL.

Arrow diagram C2:

The diagram reflects MT-messaging by means of interlayer service primitives and the actual messages being transferred between the layer entities.

- SM-RL-primitives indicate services provided by SM-RL to SM-TL and RL (* see note).
- MNSMS-primitives indicate services provided by CM to SM-RL.
- RP-DATA is the SM-RL message carrying SM-TP data units.
- RP-ACK acknowledges RP-DATA reception on SM-RL.

Arrow diagram C3:

The diagram reflects memory available notification transfer by means of interlayer service primitives and the actual messages being transferred between the layer entities.

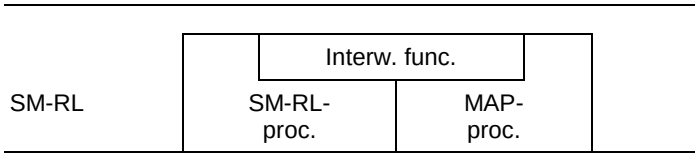
- SM-RL-primitives indicate services provided by SM-RL to SM-TL and RL (* see note).
- MNSMS-primitives indicate services provided by CM to SM-RL.
- RP-SMMA is the SM-RL message indicating that the mobile has memory available to receive one or more short messages.
- RP-ACK acknowledges RP-SMMA reception on SM-RL.
- RP-ERROR reports a failure in the notification procedure on the network side.

Arrow diagram C4:

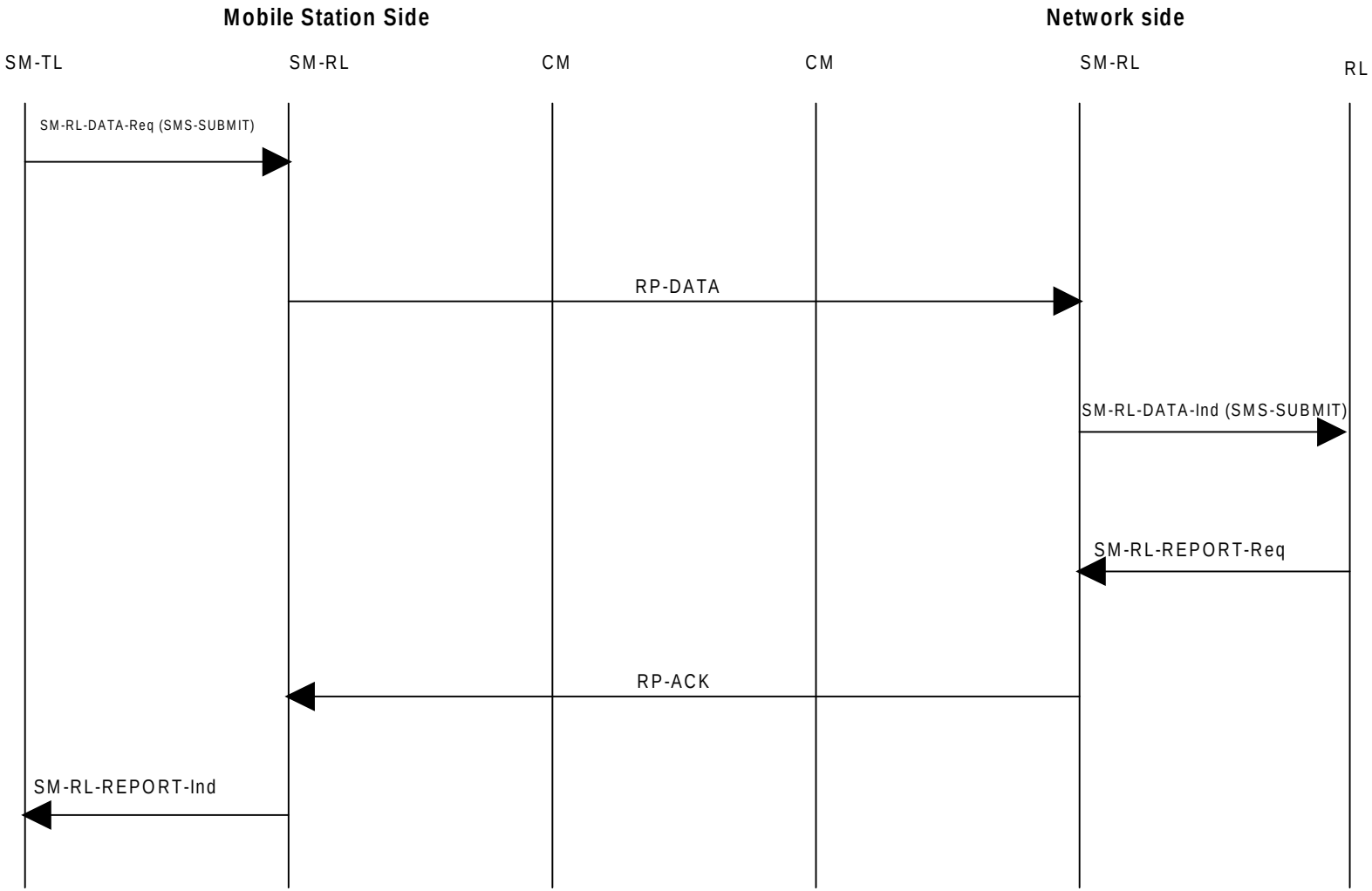
The diagram reflects the abort of any retransmission of a memory available notification by SM-RL by means of the SM-RL-MEMORY-AVAILABLE interlayer service primitive request with the SM-MEM-NOTIF-ABORT parameter present. The use of this primitive and the associated parameter are, of course, local to the mobile station.

- SM-RL-primitives indicate services provided by SM-RL to SM-TL and RL (note).
- MNSMS-primitives indicate services provided by CM to SM-RL.
- RP-SMMA is the SM-RL message indicating that the mobile has memory available to receive one or more short messages.
- RP-ACK acknowledges RP-SMMA reception on SM-RL.
- RP-ERROR reports a failure in the notification procedure on the network side.

NOTE: The SM-RL being the upper layer in the MSC, an interworking function between SM-RL-procedures and MAP-procedure is necessary. The term "RL" is used in the diagrams to indicate this function (see figure).

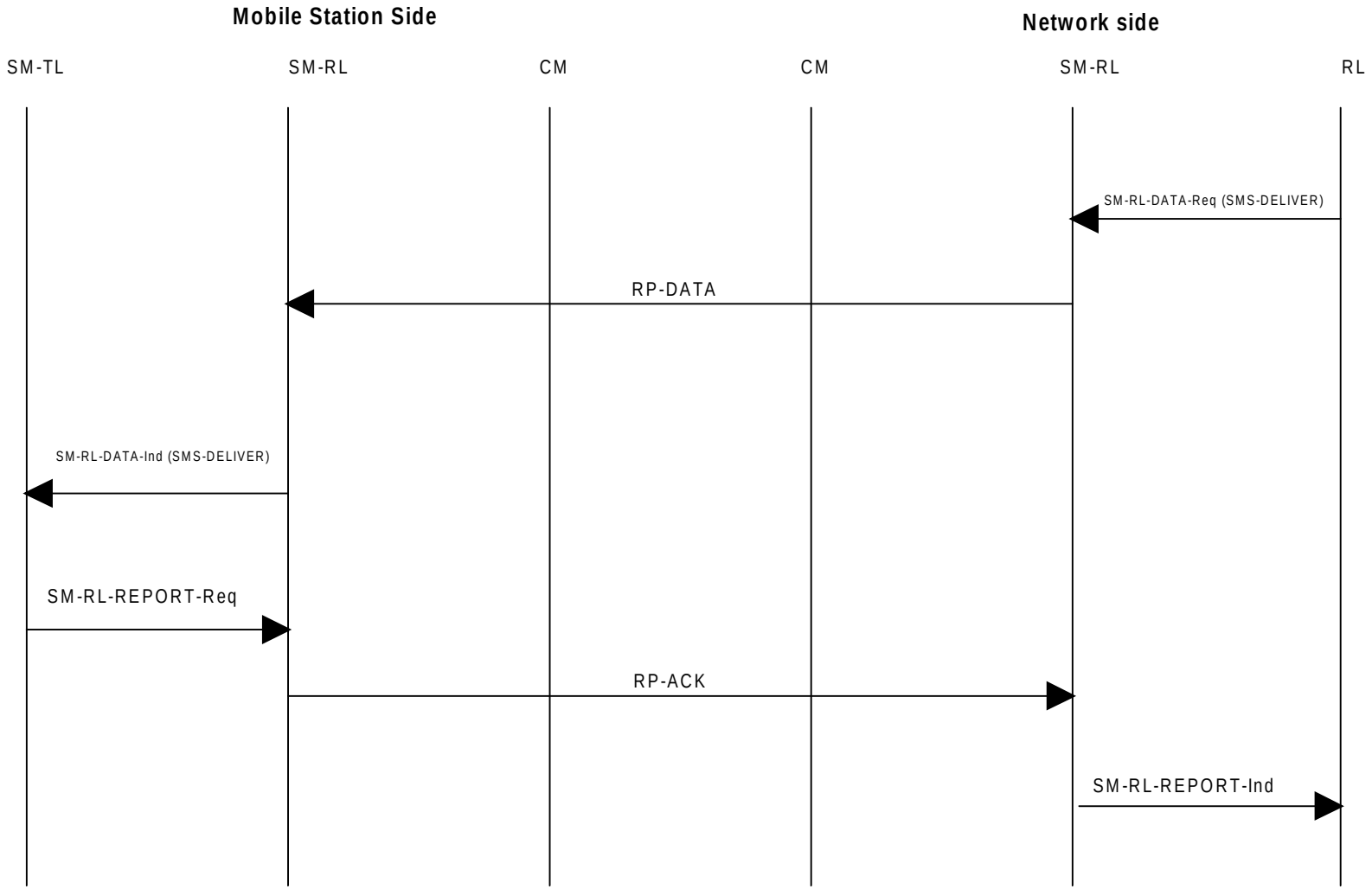


Mobile Originated Messaging on SM-RL



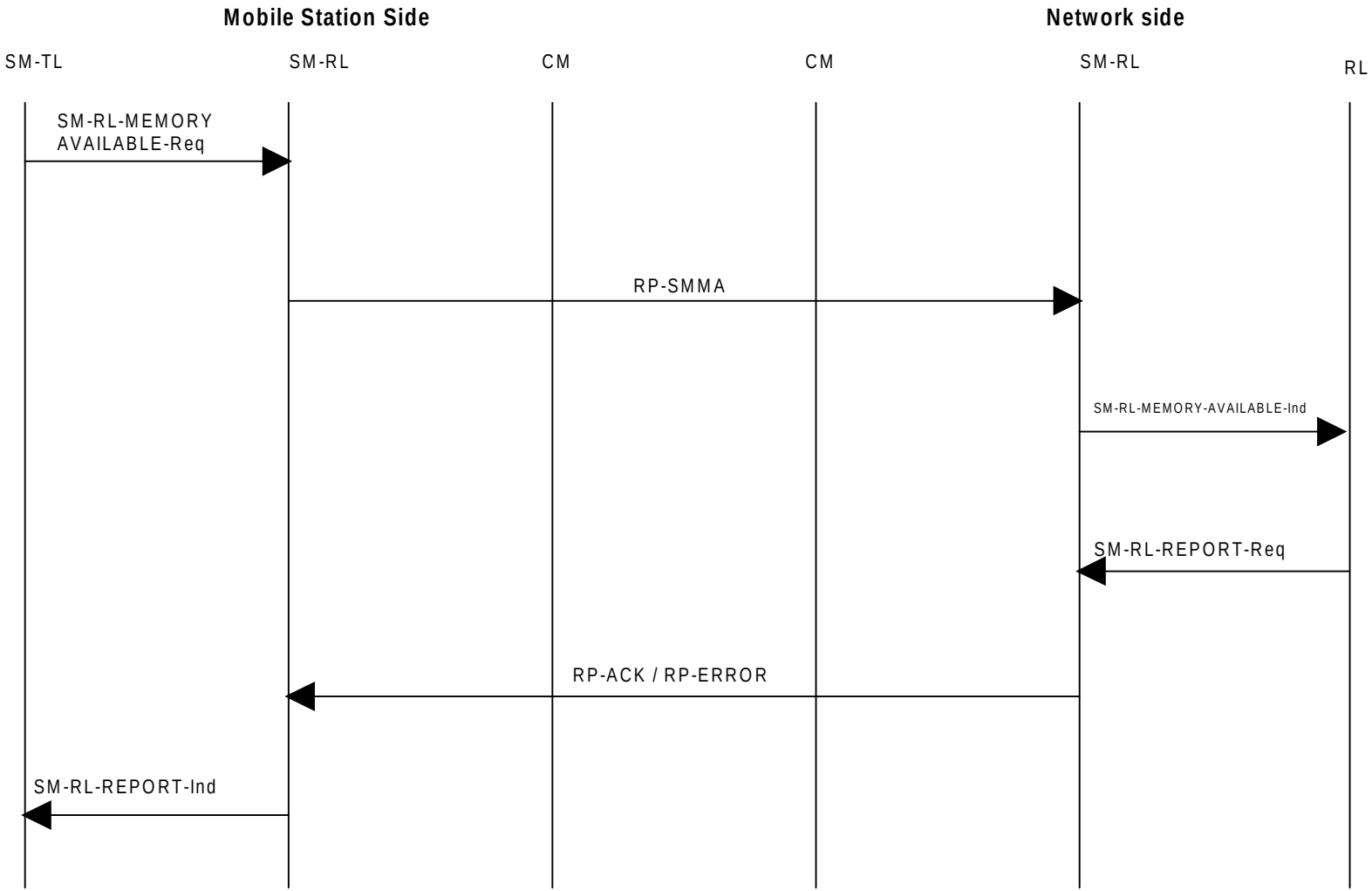
Arrow diagram C1

Mobile Terminated Messaging on SM-RL



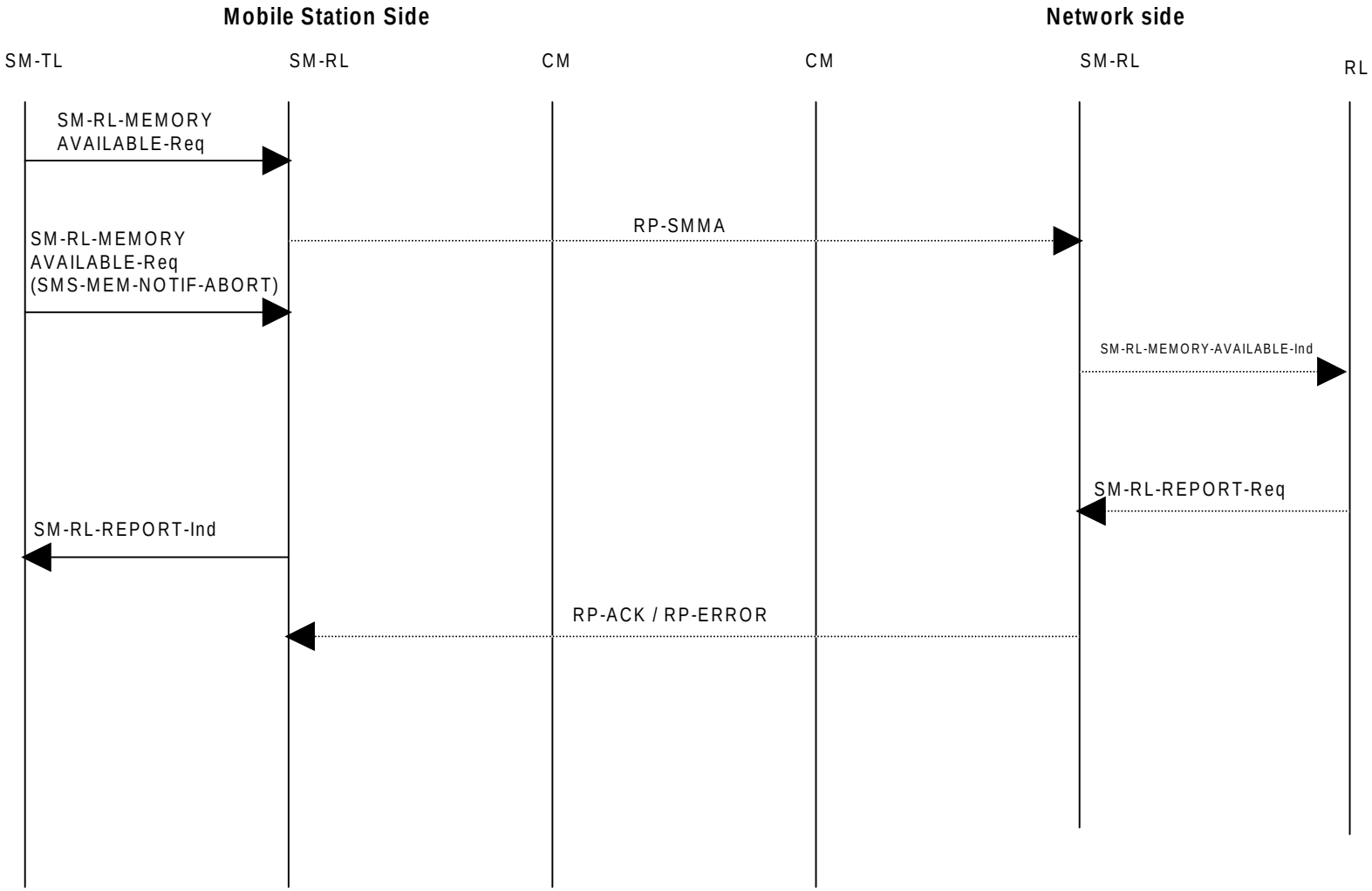
Arrow diagram C2

Memory Available Notification on SM-RL



Arrow diagram C3

Memory Available Notification Abort on SM-RL



NOTE: Dashed lines indicates messages that may be sent, even though an abort request was given.

Arrow diagram C4

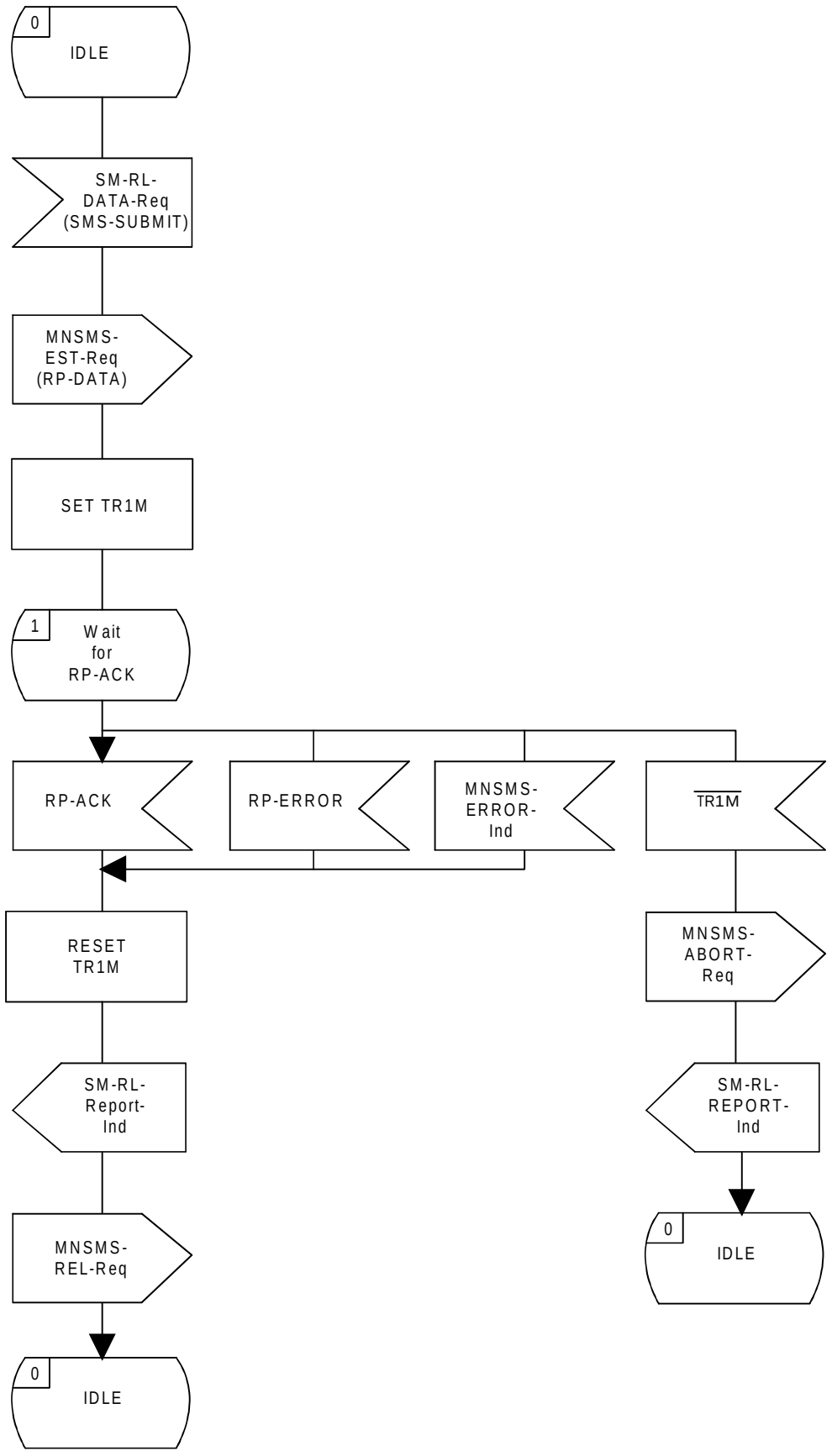
Annex D (normative): SDL-description of the short message relay layer

D.1 Introduction

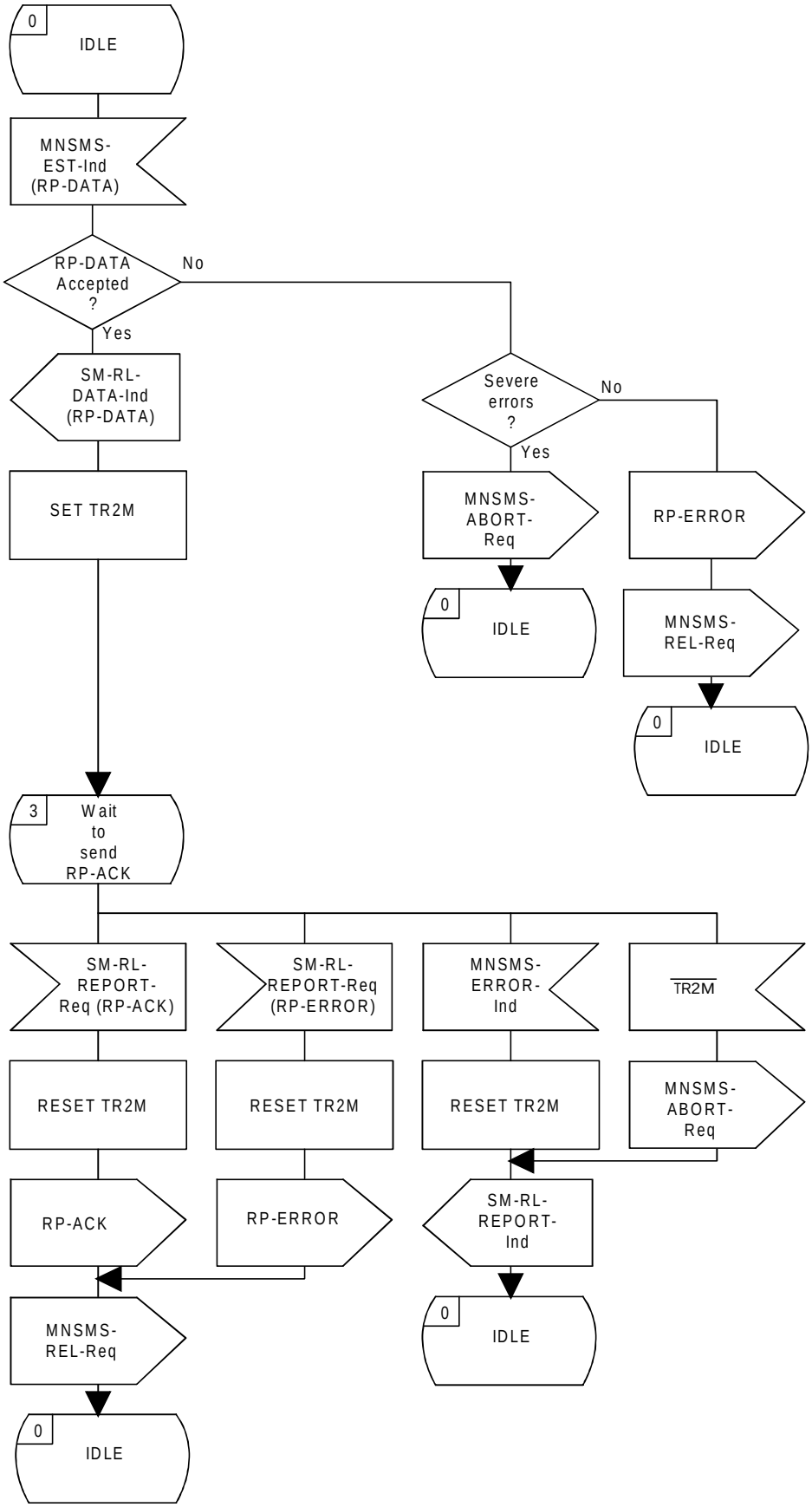
This annex contains an SDL-description of the Short Message Relay Layer in terms of the Short Message Service Support. The Short Message Relay Layer provides services to Short Message Transfer Layer.

The SDLs contain a mixture of peer to peer messages and conceptual primitives between the layers SM-TL, SM-RL and CM, as viewed by the SMR entities. SDL-1/2/3 show the SMR entity on MS-side, and SDL-4/5 on the network side.

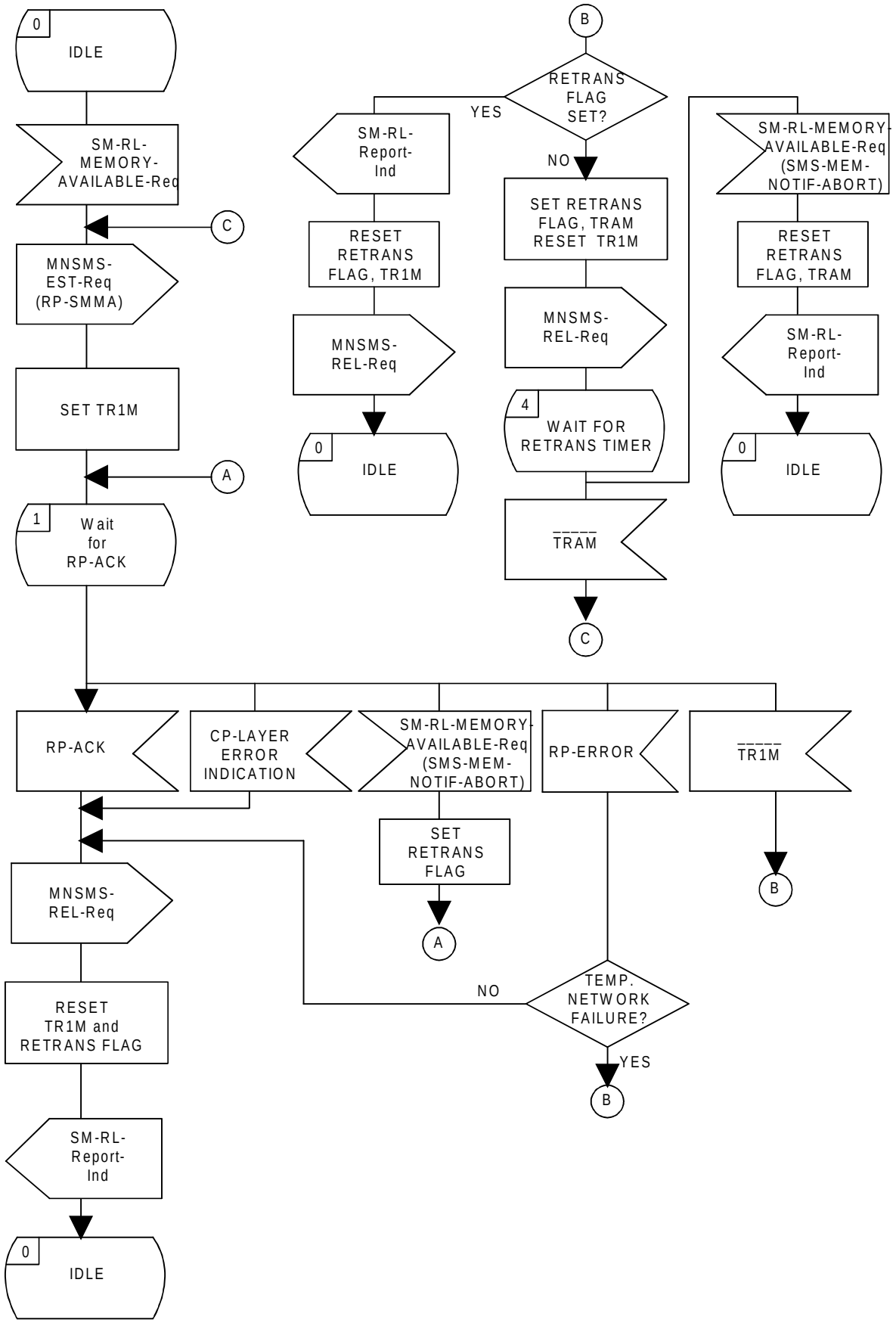
The lower layers (below CM) are transparent to an SMR entity.



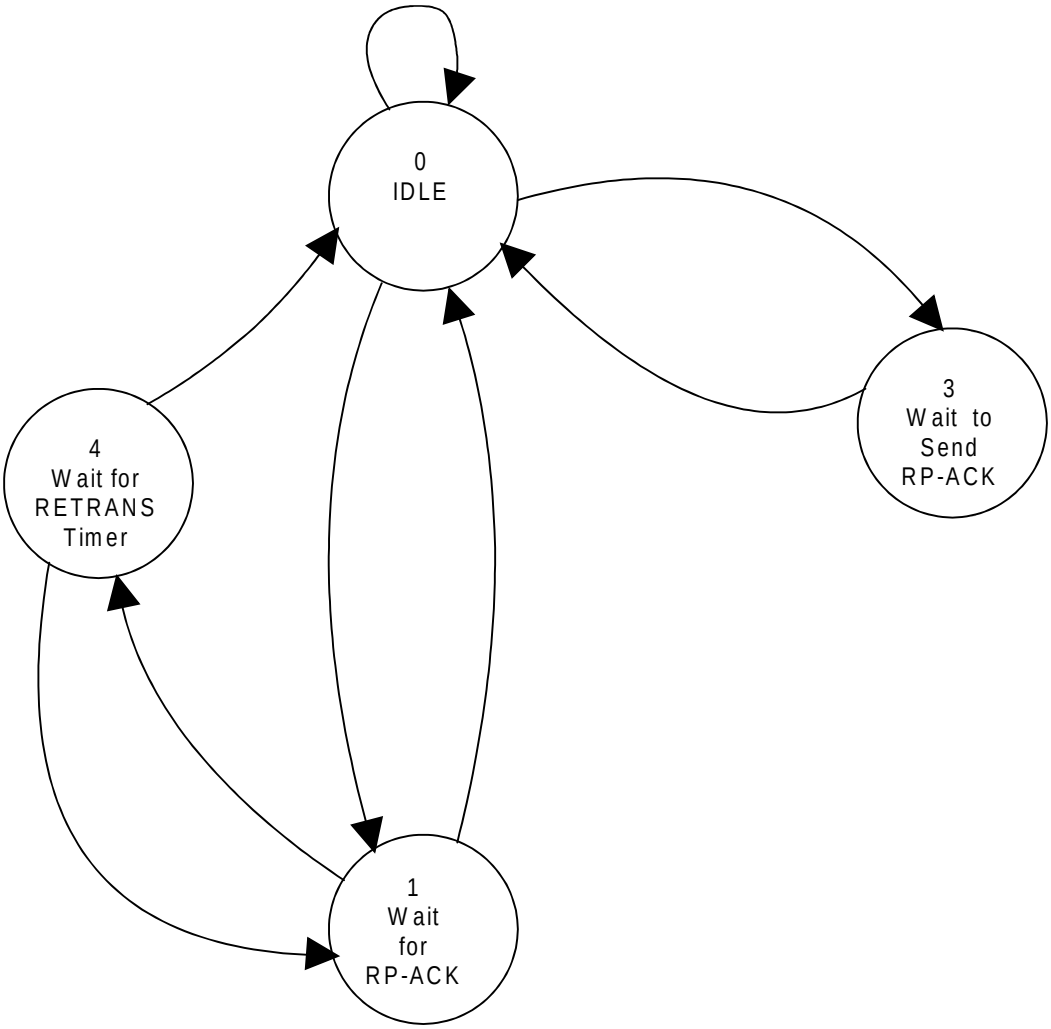
SMR-entity on MS-side
MO Short Message transfer
SDL-1



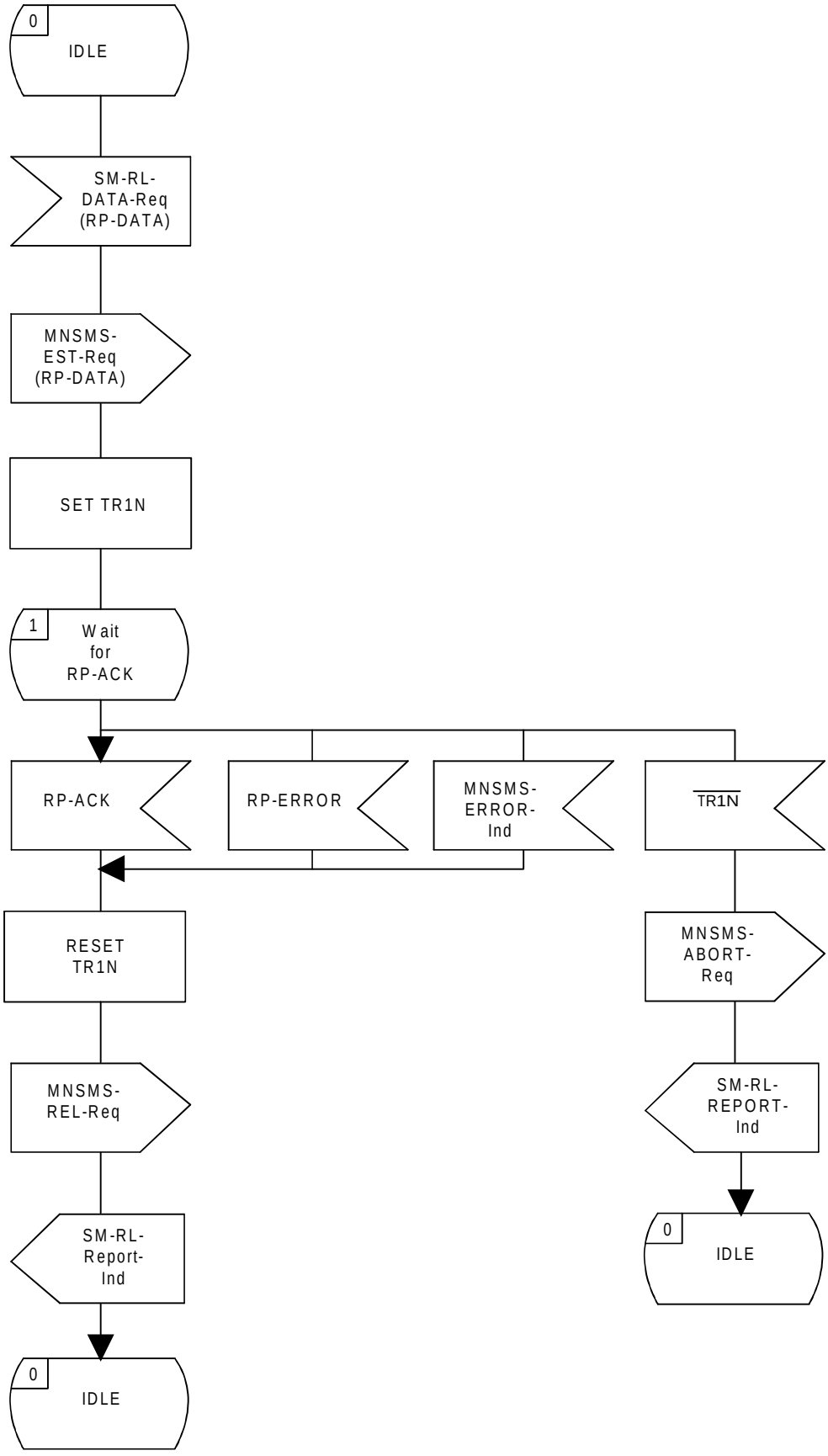
SMR-entity on MS-side
MT Short Message transfer
SDL-2



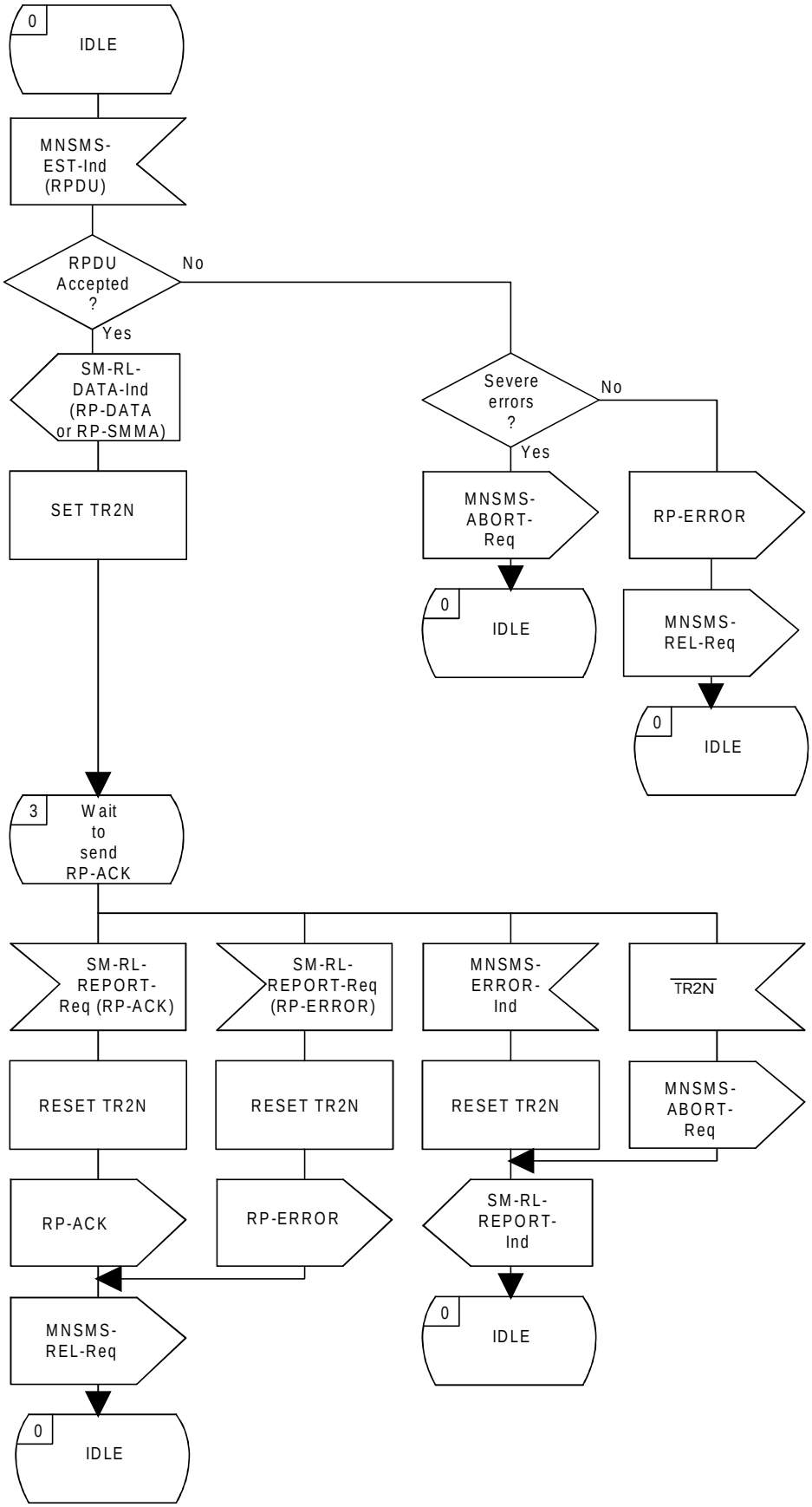
SMR-entity on MS-side
Memory Available Notification
SDL-3



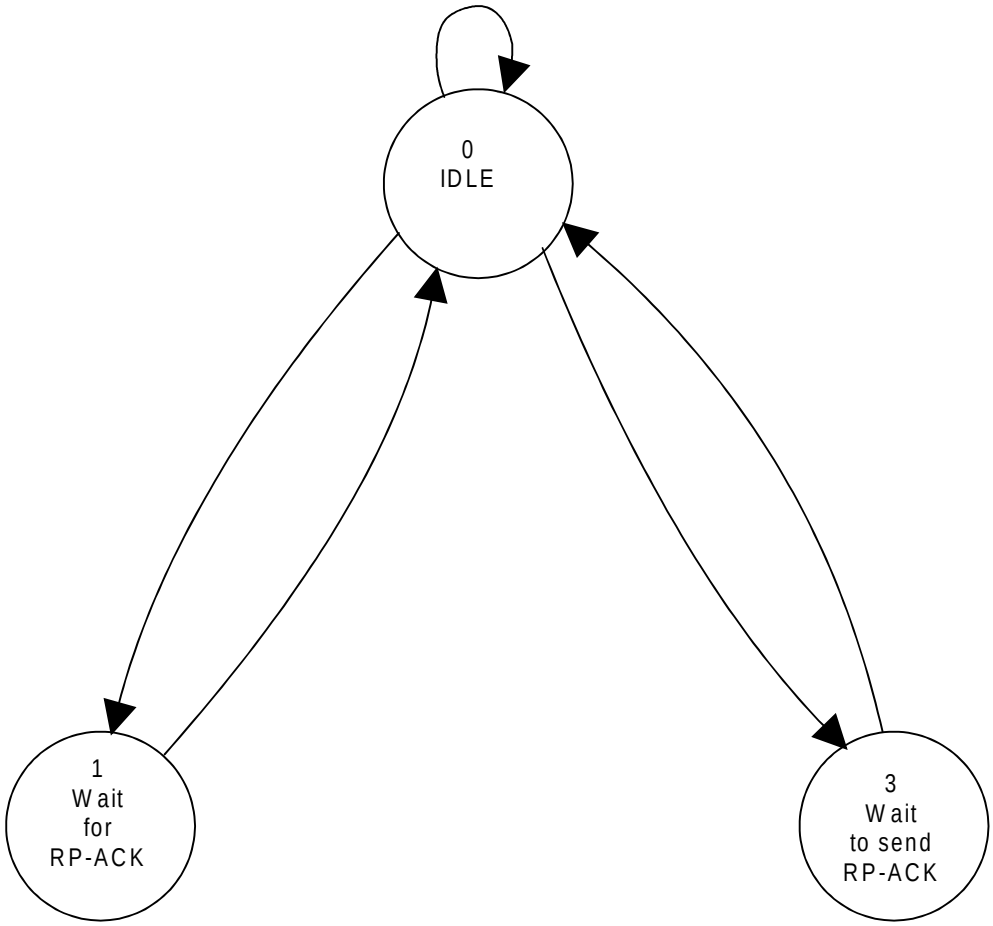
SMR-entity on MS-side
State transition diagram



SMR-entity on Network-side
MT Short Message transfer
SDL-4



SMR-entity on Network-side
MO Short Message and Notification transfer
SDL-5



SMR-entity on Network-side
State transition diagram

Annex E (informative): Cause definition

E-1: CP-cause definition

Cause no. 17: "Network failure"

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

Cause no. 22: "Congestion"

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

Cause no. 81: "Invalid Transaction Identifier"

This cause indicates that the equipment sending this cause has received a message with a Transaction Identifier which is currently not use on the MS - network interface.

Cause no. 95: "Semantically incorrect message"

This cause is used to report the receipt of a message with semantically incorrect content.

Cause no. 96: "Invalid mandatory information"

This cause indicates that the equipment sending this cause has received a message with non-semantical mandatory information element errors.

Cause no. 97: "Message type non-existent or not implemented"

This cause indicates that the equipment sending this cause has received a message with a message type it does not recognize either because this is a message not defined or defined but not implemented by the equipment sending this cause.

Cause no. 98: "Message not compatible with short message protocol state"

This cause indicates that the equipment sending this cause has received a message not compatible with the Short Message protocol state.

Cause no. 99: "Information element non-existent or not implemented"

This cause indicates that the equipment sending this cause has received a message which includes information elements not recognized because the information element identifier is not defined or it is defined but not implemented by the equipment sending the cause.

However, the information element is not required to be present in the message in order for the equipment sending the cause to process the message.

Cause no. 111: "Protocol error, unspecified"

This cause is used to report a protocol error event only when no other cause applies.

E-2: RP-cause definition mobile originating SM-transfer

Cause no. 1: "Unassigned (unallocated) number"

This cause indicates that the destination requested by the Mobile Station cannot be reached because, although the number is in a valid format, it is not currently assigned (allocated).

Cause no. 8: "Operator determined barring"

This cause indicates that the MS has tried to send a mobile originating short message when the MS's network operator or service provider has forbidden such transactions.

Cause no. 10: "Call barred"

This cause indicates that the outgoing call barred service applies to the short message service for the called destination.

Cause no. 21: "Short message transfer rejected"

This cause indicates that the equipment sending this cause does not wish to accept this short message, although it could have accepted the short message since the equipment sending this cause is neither busy nor incompatible.

Cause no. 27: "Destination out of service"

This cause indicates that the destination indicated by the Mobile Station cannot be reached because the interface to the destination is not functioning correctly. The term "not functioning correctly" indicates that a signalling message was unable to be delivered to the remote user; e.g., a physical layer or data link layer failure at the remote user, user equipment off-line, etc.

Cause no. 28: "Unidentified subscriber"

This cause indicates that the subscriber is not registered in the PLMN (i.e. IMSI not known).

Cause no. 29: "Facility rejected"

This cause indicates that the facility requested by the Mobile Station is not supported by the PLMN.

Cause no. 30: "Unknown subscriber"

This cause indicates that the subscriber is not registered in the HLR (i.e. IMSI or directory number is not allocated to a subscriber).

Cause no. 38: "Network out of order"

This cause indicates that the network is not functioning correctly and that the condition is likely to last a relatively long period of time; e.g., immediately reattempting the short message transfer is not likely to be successful.

Cause no. 41: "Temporary failure"

This cause indicates that the network is not functioning correctly and that the condition is not likely to last a long period of time; e.g., the Mobile Station may wish to try another short message transfer attempt almost immediately.

Cause no. 42: "Congestion"

This cause indicates that the short message service cannot be serviced because of high traffic.

Cause no. 47: "Resources unavailable, unspecified"

This cause is used to report a resource unavailable event only when no other cause applies.

Cause no. 50: "Requested facility not subscribed"

This cause indicates that the requested short message service could not be provided by the network because the user has not completed the necessary administrative arrangements with its supporting networks.

Cause no. 69: "Requested facility not implemented"

This cause indicates that the network is unable to provide the requested short message service.

Cause no. 81: "Invalid short message transfer reference value"

This cause indicates that the equipment sending this cause has received a message with a short message reference which is not currently in use on the MS-network interface.

Cause no. 95: "Invalid message, unspecified"

This cause is used to report an invalid message event only when no other cause in the invalid message class applies.

Cause no. 96: "Invalid mandatory information"

This cause indicates that the equipment sending this cause has received a message where a mandatory information element is missing and/or has a content error (the two cases are indistinguishable).

Cause no. 97: "Message type non-existent or not implemented"

This cause indicates that the equipment sending this cause has received a message with a message type it does not recognize either because this is a message not defined or defined but not implemented by the equipment sending this cause.

Cause no. 98: "Message not compatible with short message protocol state"

This cause indicates that the equipment sending this cause has received a message such that the procedures do not indicate that this is a permissible message to receive while in the short message transfer state.

Cause no. 99: "Information element non-existent or not implemented"

This cause indicates that the equipment sending this cause has received a message which includes information elements not recognized because the information element identifier is not defined or it is defined but not implemented by the equipment sending the cause.

However, the information element is not required to be present in the message in order for the equipment sending the cause to process the message.

Cause no. 111: "Protocol error, unspecified"

This cause is used to report a protocol error event only when no other cause applies.

Cause no. 127: "Interworking, unspecified"

This cause indicates that there has been interworking with a network which does not provide causes for actions it takes; thus, the precise cause for a message which is being send cannot be ascertained.

E-3: RP-cause definition mobile terminating SM-transfer

Cause no. 22: "Memory capacity exceeded"

This cause indicates that the mobile station cannot store the incoming short message due to lack of storage capacity.

Cause no. 81: "Invalid short message reference value"

This cause indicates that the equipment sending this cause has received a message with a short message reference which is not currently in use on the MS-network interface.

Cause no. 95: "Invalid message, unspecified"

This cause is used to report an invalid message event only when no other cause in the invalid message class applies.

Cause no. 96: "Invalid mandatory information"

This cause indicates that the equipment sending this cause has received a message where a mandatory information element is missing and/or has a content error (the two cases are indistinguishable).

Cause no. 97: "Message type non-existent or not implemented"

This cause indicates that the equipment sending this cause has received a message with a message type it does not recognize either because this is a message not defined or defined but not implemented by the equipment sending this cause.

Cause no. 98: "Message not compatible with short message protocol state"

This cause indicates that the equipment sending this cause has received a message such that the procedures do not indicate that this is a permissible message to receive while in the short message transfer state.

Cause no. 99: "Information element non-existent or not implemented"

This cause indicates that the equipment sending this cause has received a message which includes information elements not recognized because the information element identifier is not defined or it is defined but not implemented by the equipment sending the cause.

However, the information element is not required to be present in the message in order for the equipment sending the cause to process the message.

Cause no. 111: "Protocol error, unspecified"

This cause is used to report a protocol error event only when no other cause applies.

E-4: RP-Cause definition memory available notification

Cause no. 30: "Unknown Subscriber"

This cause indicates that the subscriber is not registered in the HLR (i.e. IMSI or directory number is not allocated to a subscriber).

Cause no. 38: "Network out of order"

This cause indicates that the network is not functioning correctly and that the condition is likely to last a relatively long period of time; e.g., immediately reattempting the short message transfer is not likely to be successful.

Cause no. 41: "Temporary failure"

This cause indicates that the network is not functioning correctly and that the condition is not likely to last a long period of time; e.g., the Mobile Station may wish to try another short message transfer attempt almost immediately.

Cause no. 42: "Congestion"

This cause indicates that the short message service cannot be serviced because of high traffic.

Cause no. 47: "Resources unavailable, unspecified"

This cause is used to report a resource unavailable event only when no other cause applies.

Cause no. 69: "Requested facility not implemented"

This cause indicates that the network is unable to provide the requested memory available notification service.

Cause no. 95: "Invalid message, unspecified"

This cause is used to report an invalid message event only when no other cause in the invalid message class applies.

Cause no. 96: "Invalid mandatory information"

This cause indicates that the equipment sending this cause has received a message where a mandatory information element is missing and/or has a content error (the two cases are indistinguishable).

Cause no. 97: "Message type non-existent or not implemented"

This cause indicates that the equipment sending this cause has received a message with a message type it does not recognize either because this is a message not defined or defined but not implemented by the equipment sending this cause.

Cause no. 98: "Message not compatible with short message protocol state"

This cause indicates that the equipment sending this cause has received a message such that the procedures do not indicate that this is a permissible message to receive while in the short message transfer state.

Cause no. 99: "Information element non-existent or not implemented"

This cause indicates that the equipment sending this cause has received a message which includes information elements not recognized because the information element identifier is not defined or it is defined but not implemented by the equipment sending the cause.

However, the information element is not required to be present in the message in order for the equipment sending the cause to process the message.

Cause no. 111: "Protocol error, unspecified"

This cause is used to report a protocol error event only when no other cause applies.

Cause no. 127: "Interworking, unspecified"

This cause indicates that there has been interworking with a network which does not provide causes for actions it takes; thus, the precise cause for a message which is being send cannot be ascertained.

Annex F (informative): LAPDm SAPI 3 handling for short message service

This annex describes several typical SMS message transfer scenarios for circuit switched GSM.

For GPRS SMS transfer, refer to ~~GSM 03.60~~TS 23.060 for channel set up and upper layer message flow.

Case A: Mobile originating short message transfer, no parallel call.

The mobile station side will initiate SAPI 3 establishment by a SABM command on the SDCCH after the cipher mode has been set. If no hand over occurs, the SAPI 3 link will stay up until the last CP-ACK is received by the MSC, and the clearing procedure is invoked.

Case B: Mobile terminating short message transfer, no parallel call.

The network side, i.e. the BSS will initiate SAPI3 establishment by a SABM command on the SDCCH when the first CP-Data message is received from the MSC. If no hand over occurs, the link will stay up until the MSC has given the last CP-ack and invokes the clearing procedure.

Case C: Mobile originating short message transfer, parallel call.

The mobile station will send a SABM command on the SACCH when a CM_SERV_ACC message has been received from the network, allowing the short message transfer to start. If no hand over occurs the link will stay up until the MSC orders a explicit release, or the clearing procedure is invoked. If the parallel call is cleared before the short message transfer is finalized, the MSC will delay the clearing procedure toward the BSS, i.e. the channel release procedure is delayed.

Case D: Mobile terminating short message transfer, parallel call.

The network side, i.e. the BSS will initiate SAPI3 establishment by a SABM command on the SACCH when the first CP-DATA message is received from the MSC. The further handling is exactly as described for case C.

Case E: Mobile terminating short message transfer together with Inter-MSC hand over, parallel call.

The MAP procedures "Forward access signalling" and "Process access signalling" will be used between the two MSCs to transfer the CP-DATA, CP-ACK and CP-ERROR messages.

Case F: Mobile terminating short message transfer on SDCCH channel together with Inter-MSC hand over.

The MAP procedures "Forward access signalling" and "Process access signalling" will be used between the two MSC's to transfer the CP-DATA, CP-ACK and CP-ERROR messages.

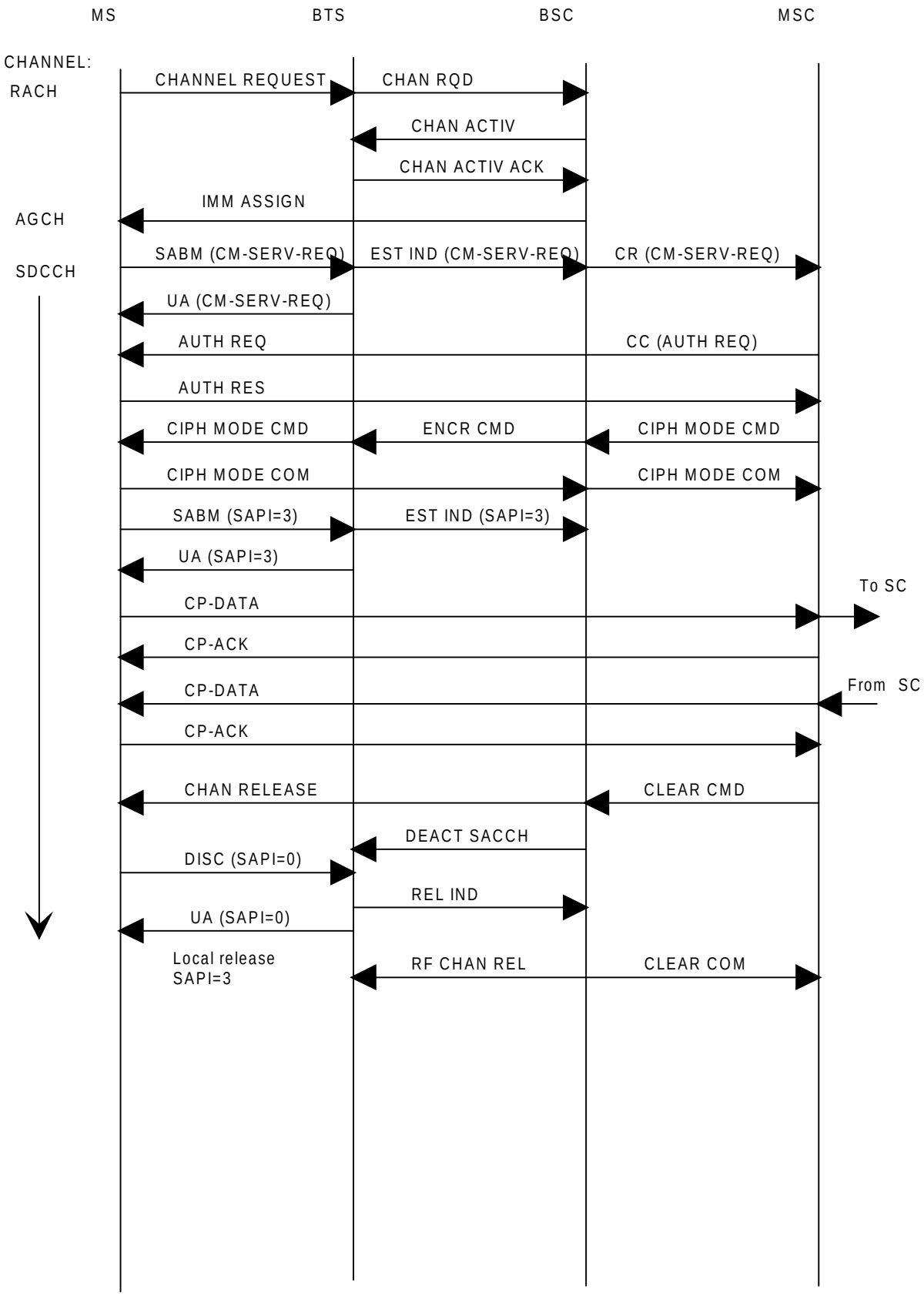


Figure F1/TS 24.011: Mobile originated Short Message on SDCCH

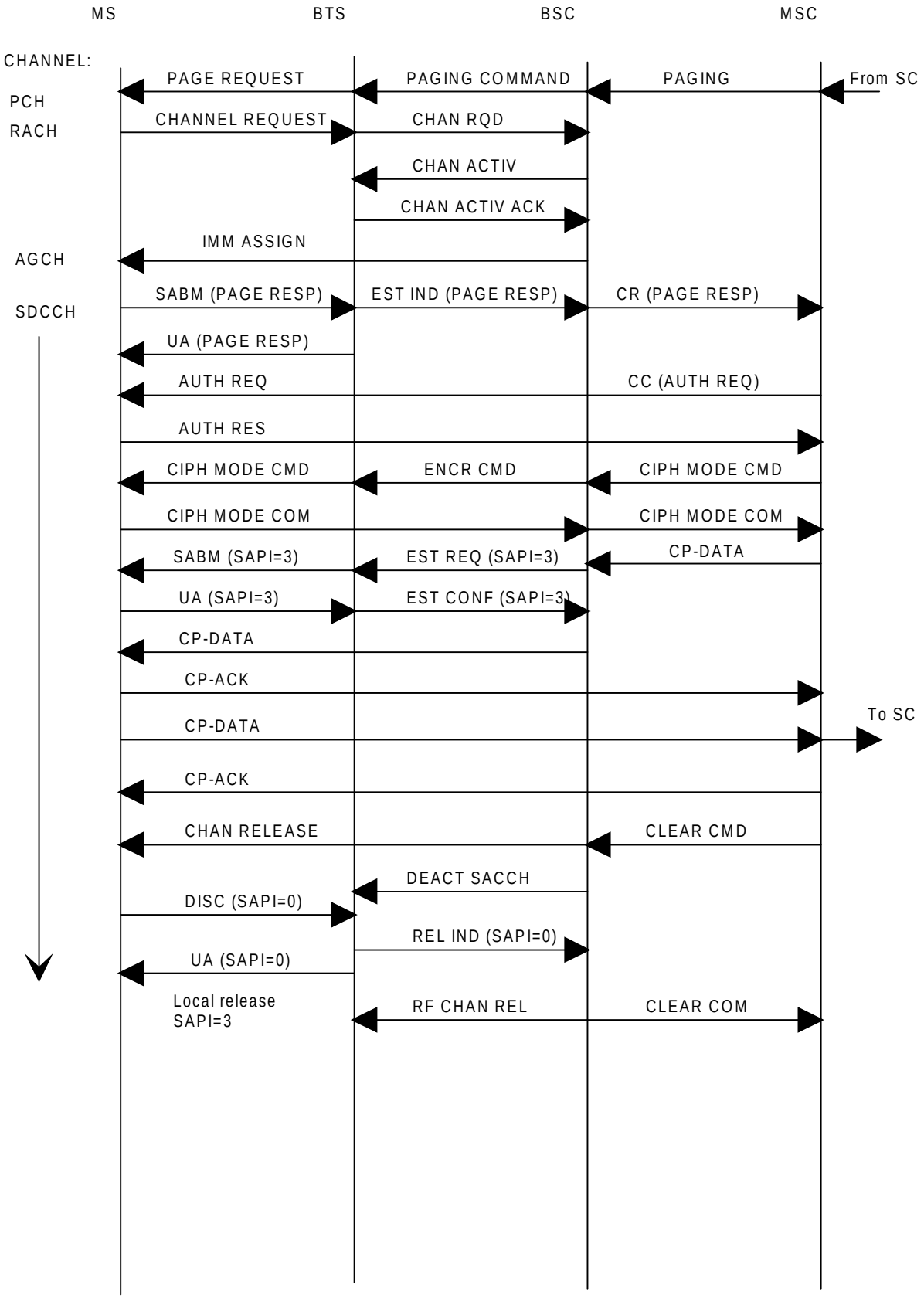


Figure F2/TS 24.011: Mobile terminated Short Message on SDCCH

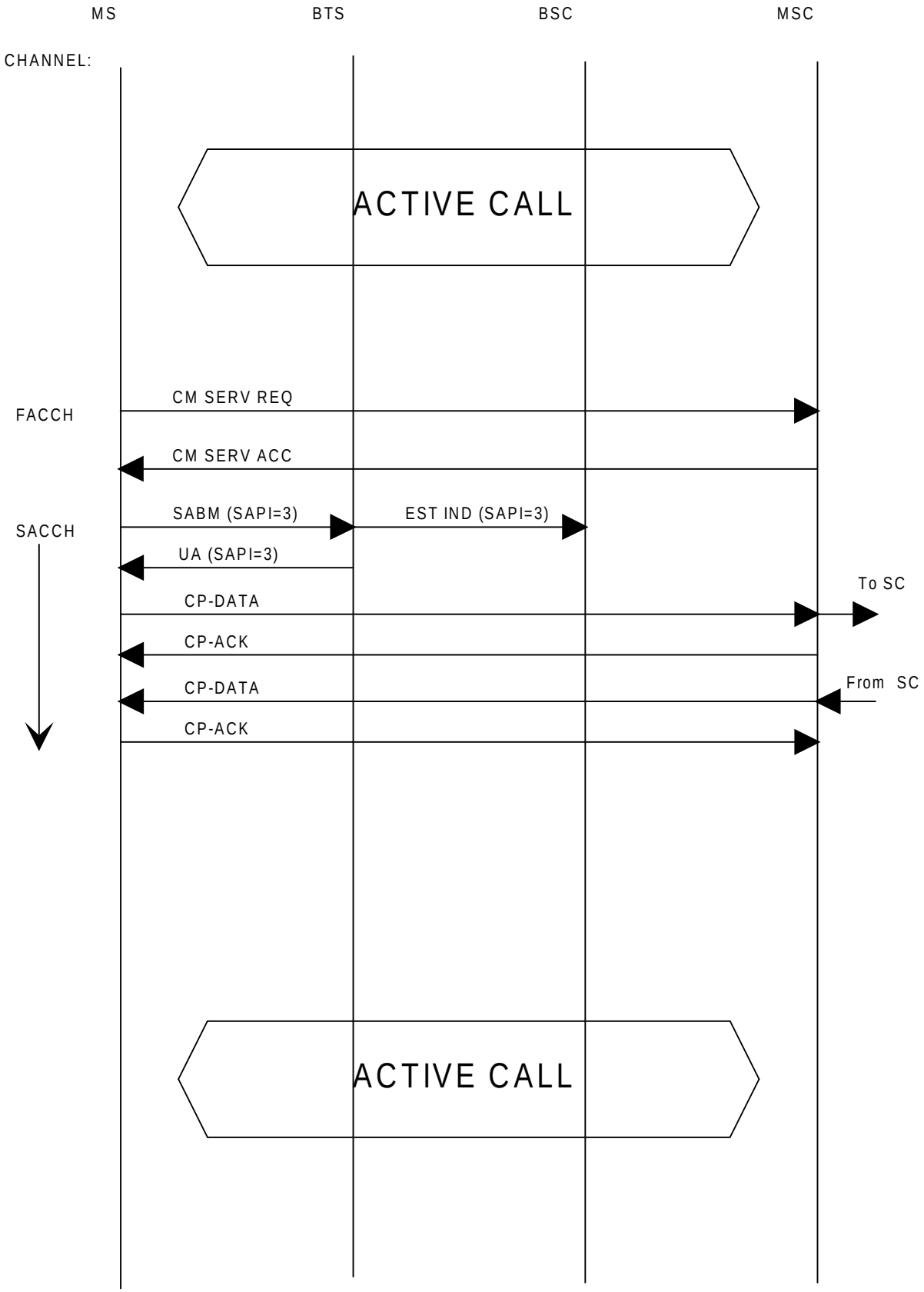


Figure F3/TS 24.011: Mobile originated Short Message on SACCH

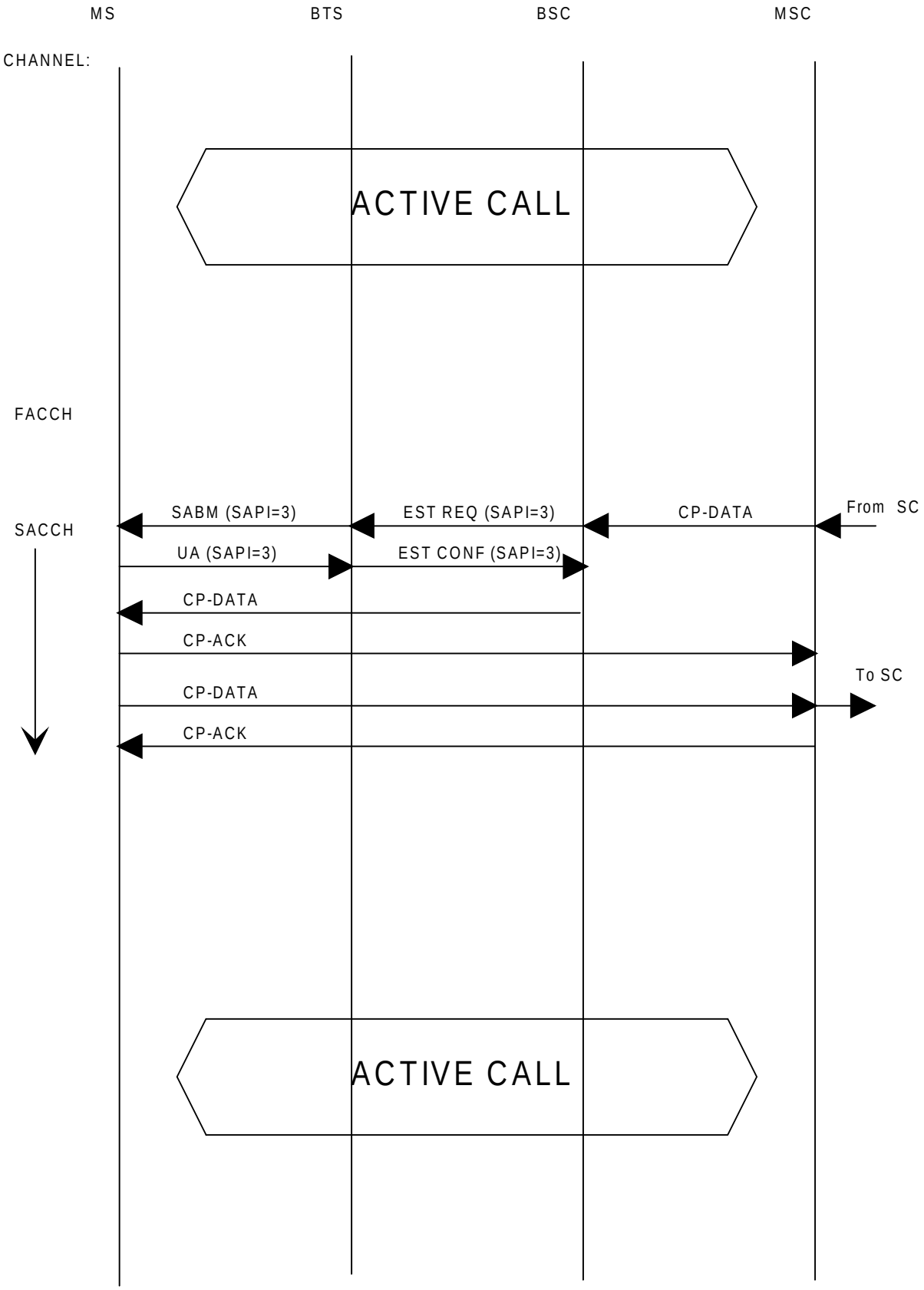


Figure F4/TS 24.011: Mobile terminated Short Message on SACCH

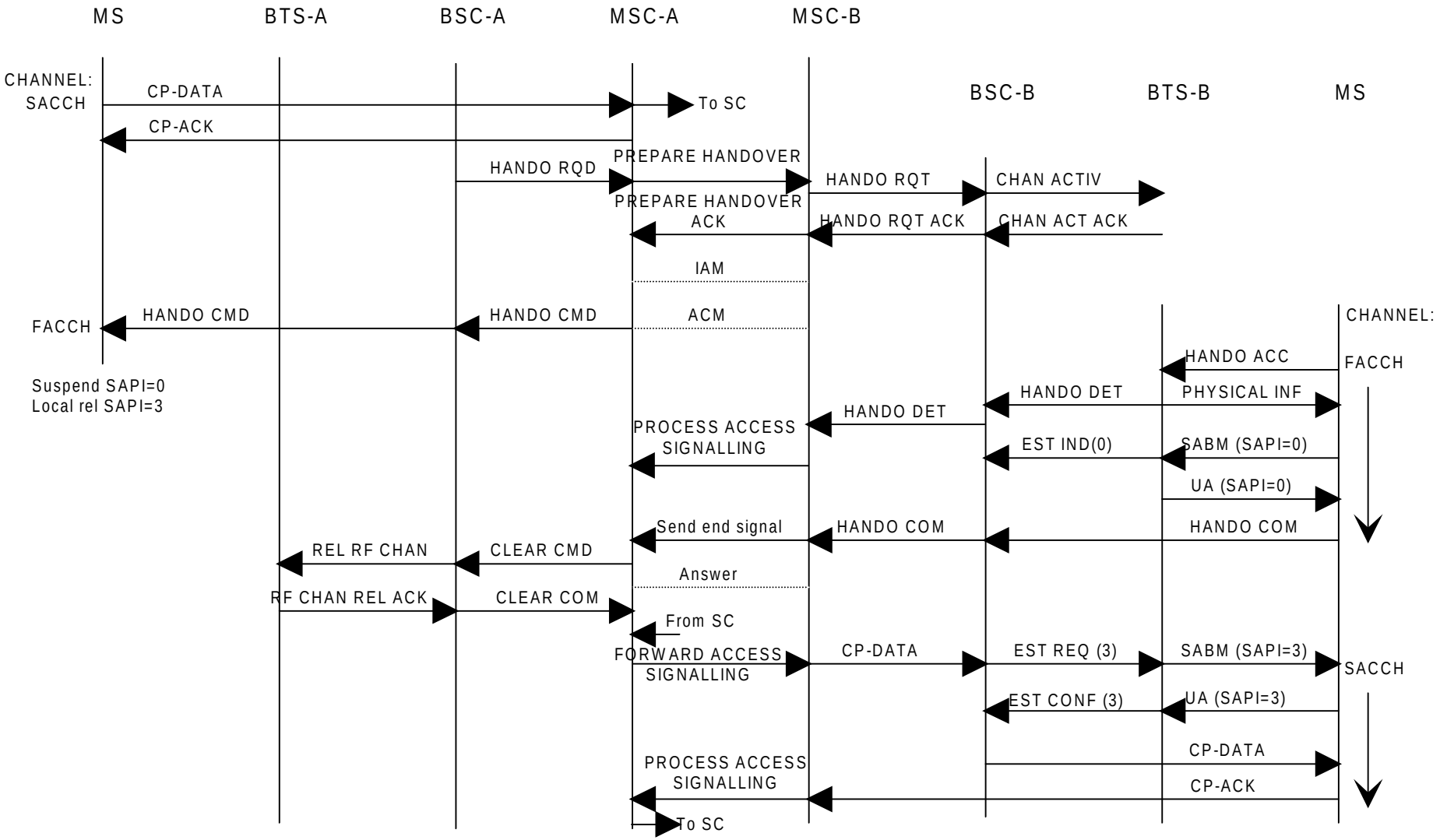


Figure F5/TS 24.011: Inter/MSC handover during Short Message transfer on SACCH

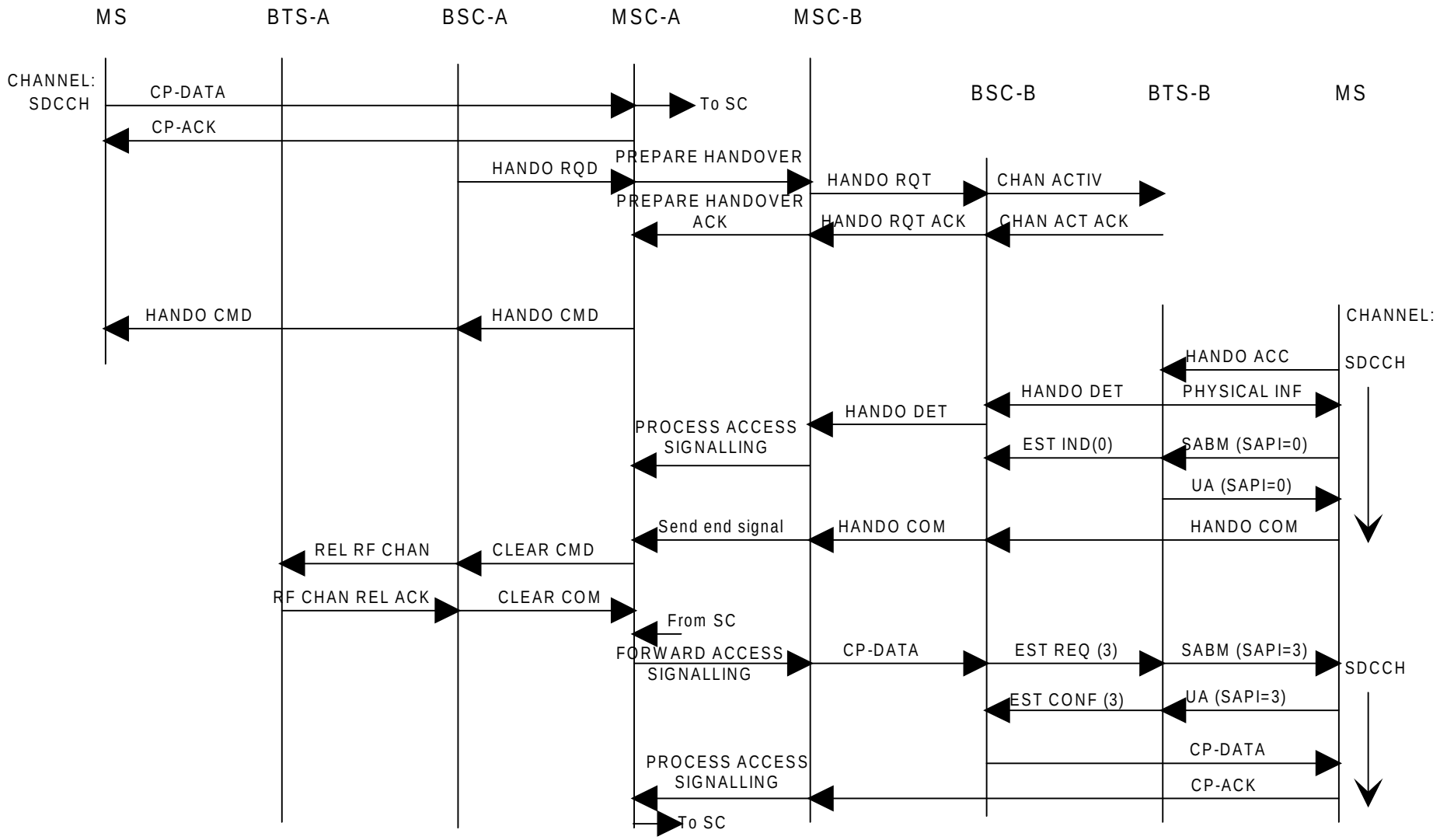


Figure F6/TS 24.011: Inter/MSC handover during Short Message transfer on SDCCH

Annex G (informative): Change history

Change history						
TSG SA#	**Spec**	**Version**	**CR**	**<Phase>**	**New Version**	**Subject/Comment**
Jun 1999	GSM 04.11	7.0.0				Transferred to 3GPP CN1
CN#04	24.011				3.0.0	
CN#06	24.011	3.0.0	001r6	R99	3.1.0	Using MM sublayer for PS-SMS message transfer

History

Document history		
V3.0.0	August 1999	Transferred to TSG CN at ETSI SMG#29. Under TSG TSG CN Change Control.
V3.1.0	December 1999	Approved at TSGN#6

3GPP/SMG Meeting #11
Umea, Sweden, 28 February - 03 March.2000

***Document* N1-000400**
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

24.008	CR	170	Current Version:	3.2.1

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	CN#7	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)*	(U)SIM		ME	X	UTRAN / Radio		Core Network	X

Source: CN1 **Date:** 28.Feb.2000

Subject: Correction of static conditions for BC IE contents

Work item: TEI

Category: *(only one category shall be marked with an X)*

F	Correction	X	**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature			Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification			Release 99	X
				Release 00	

Reason for change: According to TS27.001 v3.3.0, octet 5b dose not have to be included for multimedia and PIAFS.

Clauses affected: 10.5.4.5.1

Other specs affected:

Other 3G core specifications		→ List of CRs:
Other GSM core specifications		→ List of CRs:
MS test specifications		→ List of CRs:
BSS test specifications		→ List of CRs:
O&M specifications		→ List of CRs:

Other comments:


help.doc

<--------- double-click here for help and instructions on how to create a CR.

10.5.4.5.1 Static conditions for the bearer capability IE contents

For GSM, if the information transfer capability field (octet 3) indicates "speech", octets 4, 5, 5a, 5b, 6, 6a, 6b, 6c, 6d, 6e, 6f, 6g and 7 shall not be included.

If the information transfer capability field (octet 3) indicates "speech", octet 3a etc. shall be included only if the mobile station supports at least one speech version other than:

- GSM full rate speech version 1; or
- GSM half rate speech version 1.

If the information transfer capability field (octet 3) indicates a value different from "speech", octets 4, 5, 6, 6a, 6b, and 6c shall be included, octets 6d, 6e, 6f and 6g are optional. In the network to MS direction in case octet 6d is included, octets 6e, 6f and 6g may be included. In the MS to network direction in case octet 6d is included octet 6e shall also be included and 6f and 6g may be included.

If the information transfer capability field (octet 3) indicates "facsimile group 3", the modem type field (octet 6c) shall indicate "none".

If the information transfer capability field (octet 3) indicates "other ITC" or the rate adaption field (octet 5) indicates "other rate adaption", octet 5a shall be included.

If the rate adaption field (octet 5) indicates "other rate adaption" and the other rate adaption field (octet 5a) indicates "V.120"~~ or "H.223 and H.245" or "PIAFS",~~ octet 5b shall be included.

The modem type field (octet 6c) shall not indicate "autobauding type 1" unless the connection element field (octet 6c) indicates "non transparent".

3GPP/TSG-CN-WG1, Meeting #11
Umea, Sweden, 28.2. – 2.3.2000

N1-000373
Document rev of N1-000284
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

24.008	**CR**	**131r1**	Current Version:	3.2.1

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	CN#7	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)*	(U)SIM		ME	X	UTRAN / Radio		Core Network	X

Source: CN1 **Date:** 28-Feb-00

Subject: Extended Transaction Identifier

Work item: TEI

Category: *(only one category Shall be marked With an X)*

F	Correction	X	**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature			Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification			Release 99	X
				Release 00	

Reason for change: To increase the number of simultaneuos calls/sessions the Transaction Identifier has been extended. To that purpose the description of the error handling of Session Management and Call Control has been modified. The described behaviour will cause error cases.

Clauses affected: 8.3.1, 8.3.2

Other specs Affected:

Other 3G core specifications		→ List of CRs:
Other GSM core specifications		→ List of CRs:
MS test specifications		→ List of CRs:
BSS test specifications		→ List of CRs:
O&M specifications		→ List of CRs:

Other comments:

The extended TI has been introduced with the CRs 24.008 CR 089rev1, 24.008 CR 026rev2, and 24.007 CR 001rev5 as part of the “work package“ CC related items.

The target of this CR is to get an uniform, structured and clear behaviour both for CC and SM. Following points are fixed:

i) The TI values TIO = 0 – 6 are supported both for SM and CC.
ii) For CC no transaction with TI value > 6 can be established. All messages including a TI value from 7 –127 are ignored or in case of SETUP, EMERGENCY SETUP and START CC rejected by sending RELEASE COMPLETE containing the extension octet from the message that cause the rejection.
iii) For SM Ti values from 7 – 127 are supported. In principle 128 simultaneous MO

and 128 simultaneous MT sessions are possible. However the maximum number of simultaneous sessions is limited by the NSAPI.

iv) For Ti values greater 127, i.e. bit 8 of octet 2 (EXT) is set to ´0´, both for CC and SM all received messages are ignored.

help.doc

<--------- double-click here for help and instructions on how to create a CR.

8.3 Unknown or unforeseen transaction identifier

8.3.1 Call Control

The mobile station and the network shall ignore a Call Control message received with TI EXT bit = 0. Otherwise, if the TI EXT bit =1 or no extension is used, the behaviour described below shall be followed.

The mobile station and network shall reject a SETUP, EMERGENCY SETUP or START CC message received with octet 1 part of the TI value coded as "111" by sending RELEASE COMPLETE with cause #81 „Invalid transaction identifier value“ The TI value in RELEASE COMPLETE shall be the complete TI value including ~~all possible~~ the extension octet~~s~~ from the message that caused the rejection .

Any message other than SETUP, EMERGENCY SETUP or START CC received with octet 1 part of the TI value coded as „111“ shall be ignored.

For a call control message received with octet 1 part of the TI value not coded as "111", the following procedures shall apply:

a) For a network that does not support the „Network initiated MO call“ option and for all mobile stations:

   Whenever any call control message except EMERGENCY SETUP, SETUP or RELEASE COMPLETE is received specifying a transaction identifier which is not recognized as relating to an active call or to a call in progress, the receiving entity shall send a RELEASE COMPLETE message with cause #81 "invalid transaction identifier value" using the received transaction identifier value and remain in the Null state.

   For a network that does support the „Network initiated MO call“ option $(CCBS)$:

   Whenever any call control message except EMERGENCY SETUP, SETUP, START CC or RELEASE COMPLETE is received specifying a transaction identifier which is not recognized as relating to an active call or to a call in progress, the receiving entity shall send a RELEASE COMPLETE message with cause #81 "invalid transaction identifier value" using the received transaction identifier value and remain in the Null state.

b) When a RELEASE COMPLETE message is received specifying a transaction identifier which is not recognized as relating to an active call or to a call in progress, the MM connection associated with that transaction identifier shall be released.

c) For a network that does not support the „Network initiated MO call“ option and for all mobile stations:

   When an EMERGENCY SETUP or, a SETUP message is received specifying a transaction identifier which is not recognized as relating to an active call or to a call in progress, and with a transaction identifier flag incorrectly set to "1", this message shall be ignored.

   For a network that does support the „Network initiated MO call“ option $(CCBS)$:

When an EMERGENCY SETUP, a START CC or, a SETUP message is received specifying a transaction identifier which is not recognised as relating to an active call or to a call in progress, and with a transaction identifier flag incorrectly set to "1", this message shall be ignored.

d) When a SETUP message is received by the mobile station specifying a transaction identifier which is recognized as relating to an active call or to a call in progress, this SETUP message shall be ignored.

e) For a network that does not support the „Network initiated MO call“ option:

When an EMERGENCY SETUP message or a SETUP message is received by the network specifying a transaction identifier which is recognized as relating to an active call or to a call in progress, this message need not be treated and the network may perform other actions.

For a network that does support the „Network initiated MO call“ option $(CCBS)$:

When an EMERGENCY SETUP message or a START CC message is received by the network specifying a transaction identifier which is recognised as relating to an active call or to a call in progress, this message need not be treated and the network may perform other actions.

The same applies to a SETUP message unless the transaction has been established by a START_CC message and the network is in the „recall present“ state (N0.6).

8.3.2 Session Management

The mobile station and network shall ignore ~~reject~~ a session management message ~~other than SM-STATUS~~ received with TI EXT bit = 0 ~~by immediately sending an SM-STATUS message using the received 2 octet TI value encoding~~. ~~,~~Otherwise, the following procedures shall apply:

a) Whenever any session management message except ACTIVATE PDP CONTEXT REQUEST, ACTIVATE AA PDP CONTEXT REQUEST or SM-STATUS is received by the network specifying a transaction identifier which is not recognized as relating to an active context or to a context that is in the process of activation or deactivation or has been [recently] deactivated, the network should send a SM-STATUS message with cause #81 "invalid transaction identifier value" using the received transaction identifier value including the extension octet and remain in the PDP-INACTIVE state.

b) Whenever any session management message except REQUEST PDP CONTEXT ACTIVATION or SM-STATUS is received by the MS specifying a transaction identifier which is not recognized as relating to an active context or to a context that is in the process of activation or deactivation or has been [recently] deactivated, the MS shall send a SM-STATUS message with cause #81 "invalid transaction identifier value" using the received transaction identifier value including the extension octet and remain in the PDP-INACTIVE state.

c) When an ACTIVATE AA PDP CONTEXT REQUEST or REQUEST PDP CONTEXT ACTIVATION message is received with a transaction identifier flag set to "1", this message shall be ignored.

d) When an ACTIVATE PDP CONTEXT REQUEST message is received specifying a transaction identifier which is not recognized as relating to a context that is in the process of activation, and with a transaction identifier flag set to "1", this message shall be ignored.

e) Whenever an ACTIVATE PDP CONTEXT REQUEST or ACTIVATE AA PDP CONTEXT REQUEST message is received by the network specifying a transaction identifier relating to a PDP context not in state PDP-INACTIVE, the network shall deactivate the old PDP context relating to the received transaction identifier without notifying the MS. Furthermore, the network shall continue with the activation procedure of a new PDP context as indicated in the received message.

f) Whenever a REQUEST PDP CONTEXT ACTIVATION message is received by the MS specifying a transaction identifier relating to a PDP context not in state PDP-INACTIVE, the MS shall locally deactivate the old PDP context relating to the received transaction identifier. Furthermore, the MS shall continue with the activation procedure of a new PDP context as indicated in the received message.

********** NEXT MODIFIED SECTION **********

10.3.2 Transaction identifier

Bits 5 to 8 of the first octet of every message belonging to the protocols “Call Control; call related SS messages” and “Session Management”contain the transaction identifier (TI). The transaction identifier and its use are defined in TS 24.007 [20].
For the session management protocol, the extended TI mechanism may be used (see 24.007).
For the call control protocol, the extended TI mechanism shall be supported for the purpose of protocol error handling as specified in subclause 8.3.1

3GPP/SMG Meeting #10
Abiko, Japan, 11 - 14 January.2000

Document N1-000114
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

24.008	CR	123	Current Version:	3.2.1

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to: TSG-N#7	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑	for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)*	(U)SIM		ME	X	UTRAN / Radio		Core Network	X

Source: CN1 **Date:** 03 Dec 2000

Subject: GSM Cleanup – Removal of V.23

Work item: TEI

Category: *(only one category shall be marked with an X)*

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature			Release 97	
C	Functional modification of feature	X		Release 98	
D	Editorial modification			Release 99	X
				Release 00	

Reason for change: SMG1 has requested, among other items, the removal of the user rate option 1200/75 bit/s in R99, which implies that the V.23 modem is no longer needed. V.23 is therefore deleted.

Clauses affected: 10.5.4.5

Other specs affected:

Other 3G core specifications		→ List of CRs:	
Other GSM core specifications		→ List of CRs:	
MS test specifications		→ List of CRs:	
BSS test specifications		→ List of CRs:	
O&M specifications		→ List of CRs:	

Other comments:

help.doc

<--------- double-click here for help and instructions on how to create a CR.

TS 24.008 V3.2.0 (1999-12)

Technical Specification

3rd Generation Partnership Project; Universal Mobile Telecommunications System; Mobile radio interface layer 3 specification, Core Network Protocols - Stage 3 (TS 24.008 version 3.2.0)

Reference
DTS/TSGN-0124008U

Keywords
<keyword[, keyword]>

3GPP

Postal address

3GPP support office address
650 Route des Lucioles - Sophia Antipolis
Valbonne - FRANCE
Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Internet
http://www.3gpp.org

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/TS 24.008 and tables 10.5.102/TS 24.008 to 10.5.115/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.

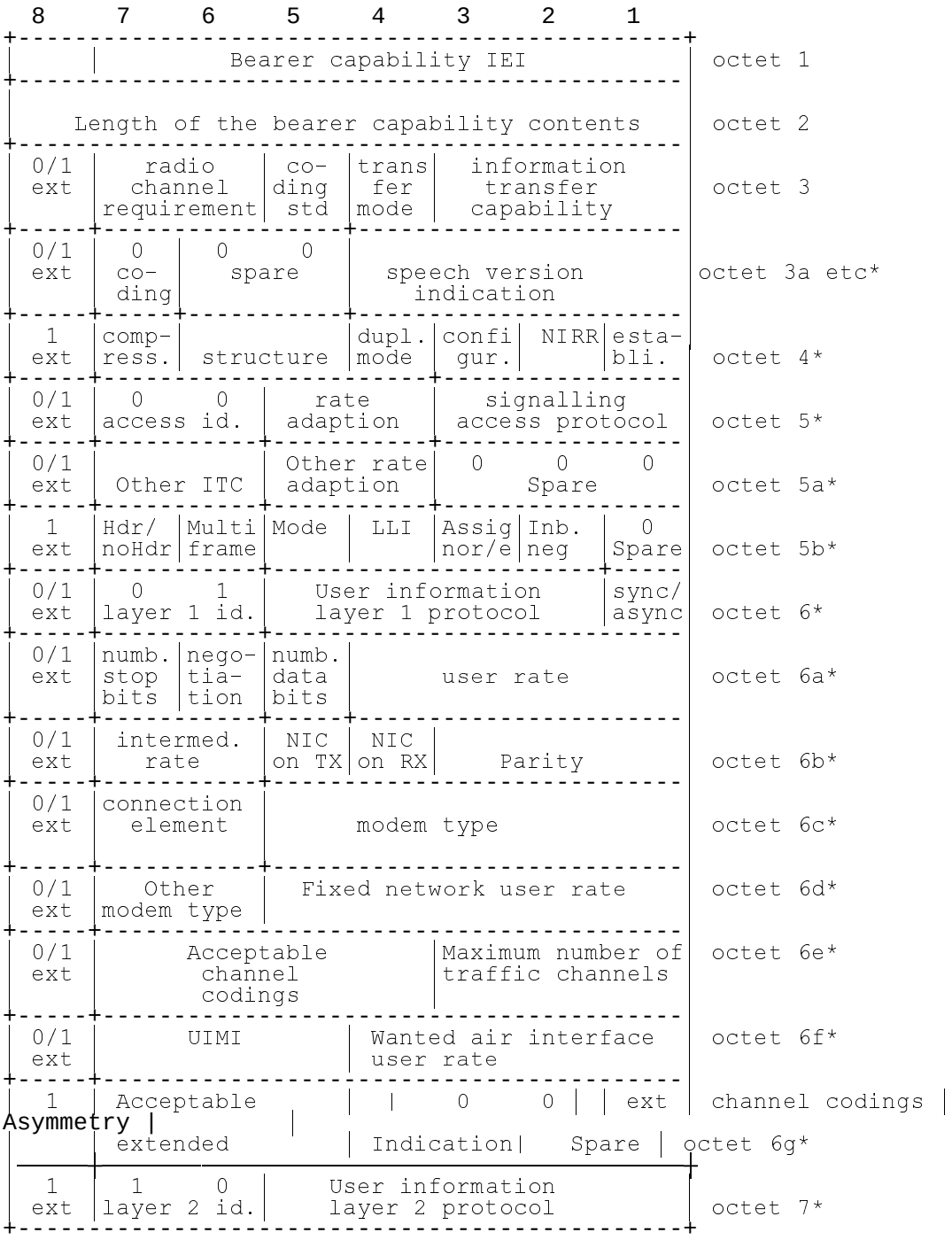


Figure 10.5.88/TS 24.008 Bearer capability information element

NOTEs: The coding of the octets of the bearer capability information element is not conforming to ITU Q.931.

An MS shall encode the Bearer Capability infomation element according to GSM call control requirements also if it is requesting for a UMTS service.

Table 10.5.102/TS 24.008: Bearer capability information element

Radio channel requirement (octet 3), network to MS direction
In GSM, i.e. not applicable for UMTS data services.

Bits 6 and 7 are spare bits. The sending side (i.e. the network) shall set bit 7 to value 0 and bit 6 to value 1.

Radio channel requirement (octet 3) MS to network direction

When information transfer capability (octet 3) indicates other values than speech:
Bits
7 6
0 0 reserved
0 1 full rate support only MS
1 0 dual rate support MS/half rate preferred
1 1 dual rate support MS/full rate preferred

When information transfer capability (octet 3) indicates the value speech and no speech version indication is present in octet 3a etc.:
Bits
7 6
0 0 reserved
0 1 full rate support only MS/fullrate speech version 1 supported
1 0 dual rate support MS/half rate speech version 1 preferred, full rate speech version 1 also supported

1 1 dual rate support MS/full rate speech version 1 preferred, half rate speech version 1 also supported

When information transfer capability (octet 3) indicates the value speech and speech version indication(s) is(are) present in octet 3a etc.:
Bits
7 6
0 0 reserved
0 1 the mobile station supports at least full rate speech version 1 but does not support half rate speech version 1. The complete voice codec preference is specified in octet(s) 3a etc.

1 0 The mobile station supports at least full rate speech version 1 and half rate speech version 1. The mobile station has a greater preference for half rate speech version 1 than for full rate speech version 1. The complete voice codec preference is specified in octet(s) 3a etc.

1 1 The mobile station supports at least full rate speech version 1 and half rate speech version 1. The mobile station has a greater preference for full rate speech version 1 than for half rate speech version 1. The complete voice codec preference is specified in octet(s) 3a etc.

Coding standard (octet 3)
Bit
5
0 GSM standardized coding as described below
1 reserved

(continued...)

Table 10.5.102/TS 24.008: Bearer capability information element (continued)

Transfer mode (octet 3)
Bit
4
0 circuit mode
1 packet mode

Information transfer capability (octet 3)
Bits
3 2 1
0 0 0 speech
0 0 1 unrestricted digital information
0 1 0 3.1 kHz audio, ex PLMN
0 1 1 facsimile group 3
1 0 1 Other ITC (See Octet 5a)
1 1 1 reserved, to be used in the network.
The meaning is: alternate speech/facsimile group 3 - starting with speech.

All other values are reserved

Table 10.5.103/TS 24.008 Bearer capability information element

Octet(s) 3a etc. MS to network direction

Coding

Bit
7
0 octet used for extension of information transfer capability
1 octet used for other extension of octet 3

When information transfer capability (octet 3) indicates speech and coding (bit 7 in octet 3a etc.) is coded as 0, bits 1 through 6 are coded:

Bits 5 and 6 are spare.

Speech version indication (octet(s) 3a etc.)
Bits
4 3 2 1
0 0 0 0 GSM full rate speech version 1
0 0 1 0 GSM full rate speech version 2
0 1 0 0 GSM full rate speech version 3
0 0 0 1 GSM half rate speech version 1
0 1 0 1 GSM half rate speech version 3

All other values have the meaning "speech version tbd" and shall be ignored when received.

If octet 3 is extended with speech version indication(s) (octets 3a etc.), all speech versions supported shall be indicated and be included in order of preference (the first octet (3a) has the highest preference and so on).

If information transfer capability (octet 3) indicates speech and coding (bit 7 in octet 3a etc.) is coded as 1, or the information transfer capability does not indicate speech, then the extension octet shall be ignored.

Octet(s) 3a etc. network to MS direction

The octet(s) 3a etc. shall be ignored by the MS.

Table 10.5.104/TS 24.008: Bearer capability information element

Compression (octet 4), network to MS direction:
Bit
7
0 data compression not possible
1 data compression possible

Compression (octet 4), MS to network direction:
Bit
7
0 data compression not allowed
1 data compression allowed

Structure (octet 4)

Bits
6 5
0 0 service data unit integrity
1 1 unstructured

All other values are reserved.

Duplex mode (octet 4)
Bit
4
0 half duplex
1 full duplex

Configuration (octet 4)
Bit
3
0 point-to-point

All other values are reserved.

NIRR (octet 4)
(Negotiation of Intermediate Rate Requested)
In GSM, i.e. not applicable for UMTS data services.

Bit
2
0 No meaning is associated with this value.
1 Data up to and including 4.8 kb/s, full rate, non-transparent, 6 kb/s radio interface rate is requested.

Establishment (octet 4)
Bit
1
0 demand

All other values are reserved

Table 10.5.105/TS 24.008: Bearer capability information element

Access identity (octet 5)
Bits
7 6
0 0 octet identifier

All other values are reserved

Rate adaption (octet 5)
Bits
5 4
0 0 no rate adaption
0 1 V.110, I.460/X.30 rate adaptation
1 0 CCITT X.31 flag stuffing
1 1 Other rate adaption (see octet 5a)

Signalling access protocol (octet 5)

Bits
3 2 1
0 0 1 I.440/450
0 1 0 X.21
0 1 1 reserved: was allocated in earlier phases of the protocol
1 0 0 reserved: was allocated in earlier phases of the protocol.
1 0 1 X.28 - non dedicated PAD
1 1 0 X.32

All other values are reserved.

Table 10.5.106/TS 24.008: Bearer capability information element

Other ITC (octet 5a)
If the value "Other ITC" is not signalled in the field "ITC" then the contents of this field shall be ignored.

Bit
7 6
0 0 restricted digital information

All other values are reserved

Other rate adaption (octet 5a)
If the value " Other rate adaption" is not signalled in the field "Rate adaption" then the contents of this field shall be ignored.
In GSM, the value of H.223 and H.245 shall be interpreted as ‘no rate adaptation’.
In UMTS, PIAFS shall be considered. In GSM, call shall be rejected if PIAFS requested.

Bit
5 4
0 0 V.120
0 1 H.223 & H.245
1 0 PIAFS

All other values are reserved.

Table 10.5.107/TS 24.008: Bearer capability information element

Rate adaption header/no header (octet 5b)

Bit
7
0 Rate adaption header not included
1 Rate adaption header included

Multiple frame establishment support in data link (octet 5b)

Bit
6
0 Multiple frame establishment not supported, only UI frames allowed
1 Multiple frame establishment supported

Mode of operation (octet 5b)

Bit
5
0 Bit transparent mode of operation
1 Protocol sensitive mode of operation

Logical link identifier negotiation (octet 5b)

Bit
4
0 Default, LLI=256 only
1 Full protocol negotiation, (note: A connection over which protocol negotiation will be executed is indicated in bit 2 of octet 5b)

Assignor/Assignee (octet 5b)

Bit
3
0 Message originator is "default assignee"
1 Message originator is "assignor only"

In band/Out of band negotiation (octet 5b)

Bit
2
0 Negotiation is done in-band using logical link zero
1 Negotiation is done with USER INFORMATION messages on a temporary signalling connection

Bit 1 is spare and set to the value "0"

Table 10.5.108/TS 24.008: Bearer capability information element

Layer 1 identity (octet 6)
Bits
7 6
0 1 octet identifier

All other values are reserved

User information layer 1 protocol (octet 6)
Bits
5 4 3 2
0 0 0 0 default layer 1 protocol

All other values reserved.

Synchronous/asynchronous (octet 6)
Bit
1
0 synchronous
1 asynchronous

Table 10.5.109/TS 24.008: Bearer capability information element

Number of Stop Bits (octet 6a)
Bit
7
0 1 bit (This value is also used in the case of synchronous mode)
1 2 bits

Negotiation (octet 6a)
Bit
6
0 in-band negotiation not possible

NOTE: See Rec. V.110 and X.30

All other values are reserved

Number of data bits excluding parity bit if present (octet 6a)
Bit
5
0 7 bits
1 8 bits (this value is also used in the case of bit oriented protocols)

User rate (octet 6a)
In GSM only.

Bits
4 3 2 1
0 0 0 1 0.3 kbit/s Recommendation X.1 and V.110
0 0 1 0 1.2 kbit/s Recommendation X.1 and V.110
0 0 1 1 2.4 kbit/s Recommendation X.1 and V.110
0 1 0 0 4.8 kbit/s Recommendation X.1 and V.110
0 1 0 1 9.6 kbit/s Recommendation X.1 and V.110
0 1 1 0 12.0 kbit/s transparent (non compliance with X.1 and V.110)
0 1 1 1 reserved: was allocated in earlier phases of the protocol.

All other values are reserved.

For facsimile group 3 calls the user rate indicates the first and maximum speed the mobile station is using.

Table 10.5.110/TS 24.008: Bearer capability information element

Octet 6b for V.110/X.30 rate adaptation Intermediate rate (octet 6b)
In GSM only.

Bits
7 6
0 0 reserved
0 1 reserved
1 0 8 kbit/s
1 1 16 kbit/s

Network independent clock (NIC) on transmission (Tx) (octet 6b) (See Rec. V.110 and X.30).
in GSM only.

Bit
5
0 does not require to send data with network independent clock
1 requires to send data with network independent clock

Network independent clock (NIC) on reception (Rx) (octet 6b) (See Rec. V.110 and X.30)
In GSM only.

Bit
4
0 cannot accept data with network independent clock (i.e. sender does not support this optional procedure)
1 can accept data with network independent clock (i.e. sender does support this optional procedure)

Parity information (octet 6b)
Bits
3 2 1
0 0 0 odd
0 1 0 even
0 1 1 none
1 0 0 forced to 0
1 0 1 forced to 1

All other values are reserved.

Table 10.5.111/TS 24.008: Bearer capability information element

Connection element (octet 6c)
Bit
7 6
0 0 transparent
0 1 non transparent (RLP)
1 0 both, transparent preferred
1 1 both, non transparent preferred

The requesting end (e.g. the one sending the SETUP message) should use the 4 values depending on its capabilities to support the different modes. The answering party shall only use the codings 00 or 01, based on its own capabilities and the proposed choice if any. If both MS and network support both transparent and non transparent, priority should be given to the MS preference.

Modem type (octet 6c)
Bits
5 4 3 2 1
0 0 0 0 0 none
0 0 0 0 1 V.21 (note 1)
0 0 0 1 0 V.22 (note 1)
0 0 0 1 1 V.22 bis (note 1)
0 0 1 0 0 ~~V.23 (note 1)~~ reserved: was allocated in earlier phases of the protocol
0 0 1 0 1 V.26 ter (note 1)
0 0 1 1 0 V.32
0 0 1 1 1 modem for undefined interface
0 1 0 0 0 autobauding type 1

All other values are reserved.
Note 1: In GSM only.

Table 10.5.112/TS 24.008: Bearer capability information element

Other modem type (octet 6d)
Bits
7 6
0 0 no other modem type specified in this field
0 1 V.32bis
1 0 V.34

All other values are reserved.

Fixed network user rate (octet 6d)
Bit
5 4 3 2 1
0 0 0 0 0 Fixed network user rate not applicable/No meaning is associated with this value.
0 0 0 0 1 9.6 kbit/s Recommendation X.1 and V.110
0 0 0 1 0 14.4 kbit/s Recommendation X.1 and V.110
0 0 0 1 1 19.2 kbit/s Recommendation X.1 and V.110
0 1 0 1 0 32.0 kbit/s Recommendation I.460 (note 2)
0 1 0 0 1 33.6 kbit/s bit transparent (note 2)
0 0 1 0 0 28.8 kbit/s Recommendation X.1 and V.110
0 0 1 0 1 38.4 kbit/s Recommendation X.1 and V.110
0 0 1 1 0 48.0 kbit/s Recommendation X.1 and V.110(synch) (note 1)
0 0 1 1 1 56.0 kbit/s Recommendation X.1 and V.110(synch) /bit transparent
0 1 0 0 0 64.0 kbit/s bit transparent
0 1 0 0 1 33.6 kbit/s bit transparent
0 1 0 1 0 32.0 kbit/s Recommendation I.460

All other values are reserved.
Note 1: In GSM only.
Note 2: In UMTS only

Table 10.5.113/TS 24.008: Bearer capability information element

Acceptable channel codings (octet 6e), mobile station to network direction:
In GSM only.

Bit
7
0 TCH/F14.4 not acceptable
1 TCH/F14.4 acceptable

Bit
6
0 Spare

Bit
5
0 TCH/F9.6 not acceptable
1 TCH/F9.6 acceptable

Bit
4
0 TCH/F4.8 not acceptable
1 TCH/F4.8 acceptable

Acceptable channel codings (octet 6e), network to MS direction:
Bits 4 to 7 are spare and shall be set to "0".

Maximum number of traffic channels (octet 6e), MS to network direction:
In GSM only.

Bits
3 2 1
0 0 0 1 TCH
0 0 1 2 TCH
0 1 0 3 TCH
0 1 1 4 TCH
1 0 0 5 TCH
1 0 1 6 TCH
1 1 0 7 TCH
1 1 1 8 TCH

Maximum number of traffic channels (octet 6e), network to MS direction:
Bits 1 to 3 are spare and shall be set to “0”.

Table 10.5.114/TS 24.008: Bearer capability information element

UIMI, User initiated modification indication (octet 6f),
In GSM only.

7 6 5
0 0 0 User initiated modification not allowed/required/applicable
0 0 1 User initiated modification up to 1 TCH/F allowed/may be requested
0 1 0 User initiated modification up to 2 TCH/F allowed/may be requested
0 1 1 User initiated modification up to 3 TCH/F allowed/may be requested
1 0 0 User initiated modification up to 4 TCH/F allowed/may be requested

All other values shall be interpreted as “User initiated modification up to 4 TCH/F may be requested”.

User initiated modification indication is not applicable for transparent connection.

Wanted air interface user rate (octet 6f), MS to network direction:
Bits
4 3 2 1
0 0 0 0 Air interface user rate not applicable/No meaning associated with this value
0 0 0 1 9.6 kbit/s
0 0 1 0 14.4 kbit/s
0 0 1 1 19.2 kbit/s
0 1 0 1 28.8 kbit/s
0 1 1 0 38.4 kbit/s
0 1 1 1 43.2 kbit/s
1 0 0 0 57.6 kbit/s
1 0 0 1 interpreted by the network as 38.4 kbit/s in this version of the protocol
1 0 1 0 interpreted by the network as 38.4 kbit/s in this version of the protocol
1 0 1 1 interpreted by the network as 38.4 kbit/s in this version of the protocol
1 1 0 0 interpreted by the network as 38.4 kbit/s in this version of the protocol

All other values are reserved.

Wanted air interface user rate (octet 6f), network to MS direction:
Bits 1 to 4 are spare and shall be set to “0”.

Table 10.5.115/TS 24.008: Bearer capability information element

Layer 2 identity (octet 7)
Bits
7 6
1 0 octet identifier

All other values are reserved

User information layer 2 protocol (octet 7)

Bits
5 4 3 2 1
0 0 1 1 0 recommendation X.25, link level
0 1 0 0 0 ISO 6429, codeset 0 (DC1/DC3)
0 1 0 0 1 reserved: was allocated but never used in earlier phases of the protocol
0 1 0 1 0 videotex profile 1
0 1 1 0 0 COPnoFlCt (Character oriented Protocol with no Flow Control mechanism)
0 1 1 0 1 X.75 layer 2 modified (CAPI)

All other values are reserved.

Table 10.5.115a/TS 24.008: Bearer capability information element

Acceptable Channel Codings extended (octet 6g) mobile station to network direction:
In GSM only.

Bit
7
0 TCH/F28.8 not acceptable
1 TCH/F28.8 acceptable

Bit
6
0 TCH/F32.0 not acceptable
1 TCH/F32.0 acceptable

Bit
5
0 TCH/F43.2 not acceptable
1 TCH/F43.2 acceptable
Channel Coding Asymmetry Indication

Bits
4 3
0 0 Channel coding symmetry preferred
1 0 Downlink biased channel coding asymmetry is preferred
0 1 Uplink biased channel coding asymmetry is preferred
1 1 Unused, if received it shall be interpreted as “Channel coding symmetry preferred”

EDGE Channel Codings (octet 6g), network to MS direction:
In GSM only.

Bits 3 to 7 are spare and shall be set to "0".

Bits 2 and 1 are spare.

3GPP TSG-CN WG1 #11
Umeå, Sweden, 28 Feb - 3 Mar. 2000

Document N1-000543
Revision of N1-000520
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

29.018	CR	007r3	Current Version:	3.2.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	CN#07	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)* (U)SIM [ ] ME [ ] UTRAN / Radio [ ] Core Network [X]

Source: CN1 **Date:** 2000-02-21

Subject: Introduction of the Service Area Identification

Work item: TEI

Category: *(only one category shall be marked with an X)*

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature	X		Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification			Release 99	X
				Release 00	

Reason for change:

In 3G network, Service Area Identity consists of LAI and SAC. It is used by Core Network to identify Service Area. For example Service Area Identity is included in initial UE message instead of CGI in 3G network.

When a VLR receives the BSSAP+-LOCATION UPDATE REQUEST message, the VLR identifies the new LA from the CGI IE in the message. In UMTS, the LAI part of the serving area identity where the MS is in the current radio contact may differ from the location area which the S-RNC informs to the SGSN. Considering those situations, the new IE for the service area shall be introduced in UMTS.

Since the Direct Transfer Message has no Service Area Identity IE in TS 25.413v3.0.0 in the case the CS attach by combined routing area update is performed at a coverage area under an D-RNC which differs from S-RNC (it may happen while the packet session is longing), in this case the SGSN sends old information. So in case of MS information procedure, the SGSN shall invoke RANAP location report control procedure.

Clauses affected: 2.1; 6.3.1; 14.3; 17.1.6; 17.1.8; 17.1.11; 17.1.14; 17.1.16; 17.1.22; 18.3; 18.4.1

Other specs affected:

Other 3G core specifications	[ ]	→ List of CRs:
Other GSM core specifications	[ ]	→ List of CRs:
MS test specifications	[ ]	→ List of CRs:
BSS test specifications	[ ]	→ List of CRs:
O&M specifications	[ ]	→ List of CRs:

Other - What is the reply to the Mobile location information for UMTS in the

comments:

MS_INFORMATION_RESPONSE has been clarified.

- --Editorial modifications are included.

help.doc

<--------- double-click here for help and instructions on how to create a CR

2.1 Normative references

[1] GSM 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".

[2] GSM 02.06: "Digital cellular telecommunications system (Phase 2+); Types of Mobile Stations (MS)".

[3] GSM 02.07: "Digital cellular telecommunications system (Phase 2+); Mobile Station (MS) features".

[4] GSM 02.60: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Service description; Stage 1".

[5] GSM 03.03: "Digital cellular telecommunications system (Phase 2+); Numbering, addressing and identification".

[6] GSM 03.07: "Digital cellular telecommunications system (Phase 2+); Restoration procedures".

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

[8] GSM 03.60: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Service description; Stage 2".

[9] GSM 03.64: "Digital cellular telecommunications system (Phase 2+); Overall description of the General Packet Radio Service (GPRS) Radio interface; Stage 2".

[10] GSM 04.07: "Digital cellular telecommunications system (Phase 2+); Mobile radio interface signalling layer 3; General aspects".

[11] GSM 04.08: "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 specification".

[12] GSM 04.64: "Digital cellular telecommunications system (Phase 2+), General Packet Radio Service (GPRS); Logical Link Control (LLC)".

[13] GSM 04.65: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Subnetwork Dependent Convergence Protocol (SNDCP)".

[14] GSM 08.08: "Digital cellular telecommunications system (Phase 2+); Mobile Switching Centre - Base Station System (MSC - BSS) interface: Layer 3 specification".

[15] GSM 08.18: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Serving GPRS Support Node (SGSN) - Base Station System (BSS): BSS GPRS Protocol (BSSGP)".

[16] GSM 08.60: "Digital cellular telecommunications system (Phase 2+); Inband control of remote transcoders and rate adaptors for Enhanced Full Rate (EFR) and full rate traffic channels."

[17] GSM 09.02: "Digital cellular telecommunications system (Phase 2+); Mobile Application Part (MAP) specification".

[18] GSM 09.08: "Digital cellular telecommunications system (Phase 2+); Application of Base Station System Application Part (BSSAP) on the E-interface".

[19] GSM 09.10: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Serving GPRS Support Node (SGSN) - Visitors Location Register (VLR): Gs interface Layer 2 specification".

[20] GSM 09.16: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Serving GPRS Support Node (SGSN) - Visitors Location Register (VLR): Gs interface Layer 2 specification".

[21] CCITT Recommendation E.164: "Numbering plan for the ISDN era".

[22] 3G TS 25.413: " UTRAN Iu Interface RANAP Signalling ".

Next modification

6 Location Update for non-GPRS services procedure

6.3 Procedures in the VLR

6.3.1 Location Update Response

If the Location Update is accepted by the VLR and, if necessary by the HLR, the VLR shall:

- Move the association to the Gs-ASSOCIATED state ;
- Set the restoration indicator 'Confirmed by Radio Contact' to 'true' ;
- Update the association by storing the SGSN number included in the BSSAP+-LOCATION-UPDATE-REQUEST message ; and
- Send a BSSAP+-LOCATION-UPDATE-ACCEPT message to the sending SGSN. This message includes the Location Area Identification received in the new ~~Location Area Identification~~Cell Global Identity IE in the previous BSSAP+-LOCATION-UPDATE-REQUEST message.

Next modification

14 MS Information procedure

14.3 Procedures in the SGSN

The SGSN shall examine the type of information that is requested and if it is stored in its database shall use this information in its response to the VLR. The BSSAP+-MS-INFORMATION-RESPONSE message contains the information parameters as requested by the VLR. In GSM ~~The~~ the Mobile location information indicates a request for Cell Global Identity and Location information age. In UMTS the Mobile location information indicates a request for Service Area Identification and Location information age. In this case, the SGSN shall use the Location Report Control procedure (see TS 25.413) in order to retrieve the SA.

If the SGSN receives an Information requested information element containing a 'not supported' value, then the value part of the Mobile station state information element in the BSSAP+-MS-INFORMATION-RESPONSE message shall be set to 'Information requested not supported'.

If the information is not locally available and it is a request for mobile identity information, the SGSN forwards the IDENTITY REQUEST message to the MS indicated in the message unless the GPRS activities of the MS are suspended. Upon receipt of the IDENTITY RESPONSE message from the MS, the SGSN shall send a BSSAP+-MS-INFORMATION-RESPONSE message. The BSSAP+-MS-INFORMATION-RESPONSE message contains the information parameters as requested by the VLR. If the GPRS activities of the MS are suspended the SGSN shall return a BSSAP+-MS-INFORMATION-RESPONSE message indicating in the MS state IE 'SUSPENDED'. If the requested information is not available or obtainable at the SGSN, the SGSN shall return a BSSAP+-MS-INFORMATION-RESPONSE message to the VLR without the requested information. The SGSN should include the MS status IE in all BSSAP+-MS-INFORMATION-RESPONSE messages.

If the IMSI is not known at the SGSN, the SGSN shall return a BSSAP+-MS-INFORMATION-RESPONSE message indicating in the MS state IE 'IMSI unknown'.

Next modification

17 Message functional definitions and contents

This section defines the structure of the messages that are sent between the SGSN and the VLR.

17.1 Message Contents

17.1.6 BSSAP+-GPRS-DETACH-INDICATION message

This message is sent by the SGSN to the VLR to indicate a GPRS detach performed from the MS or the SGSN. The type of detach is indicated in the GPRS detach type IE.

Table 17.1.6/GSM 29.018: BSSAP+-GPRS-DETACH-INDICATION message content

Information Element	Type/Reference	Presence	Format	Length
Message type	Message type 18.2	M	V	1
IMSI	IMSI 18.4.10	M	TLV	6-10
SGSN number	SGSN number 18.4.22	M	TLV	5-11
IMSI detach from GPRS service type	IMSI detach from GPRS service type 18.4.17	M	TLV	3
Cell global identity	Cell global identity 18.4.1	O	TLV	10
Service area identification	Service area identification 18.4.21b	O	TLV	10

17.1.~~5~~6.1 Cell global identity (GSM only)

In GSM, ~~The~~ the SGSN shall include the Cell global identity where the mobile was in the last radio contact.

17.1.6.2 Service area identification (UMTS only)

In UMTS, the SGSN should include the Service area identification where the mobile was in the last radio contact.

Next modification

17.1.8 BSSAP+-IMSI-DETACH-INDICATION message

This message is sent by the SGSN to the VLR to indicate an IMSI detach performed from the MS. The type of detach is indicated in the IMSI detach type IE.

Table 17.1.8/GSM 29.018: BSSAP+-IMSI-DETACH-INDICATION message content

Information Element	Type/Reference	Presence	Format	Length
Message type	Message type 18.2	M	V	1
IMSI	IMSI 18.4.10	M	TLV	6-10
SGSN number	SGSN number 18.4.22	M	TLV	5-11
Detach type	IMSI detach from non-GPRS service type 18.4.11	M	TLV	3
Cell global identity	Cell global identity 18.4.1	O	TLV	10
Location information age	Location information age 18.4.14	O	TLV	4
Service area identification	Service area identification 18.4.21b	O	TLV	10

17.1.8.1 Cell global identity (GSM only)

In GSM, ~~The~~ the SGSN shall include the Cell global identity where the mobile was in the last radio contact.

17.1.8.2 Location information age

If the detach is due to implicit detach and the Cell global identity is available, then the SGSN should include the Location information age.

17.1.8.3 Service area identification (UMTS only)

In UMTS, the SGSN should include the Service area identification where the mobile was in the last radio contact.

Next modification

17.1.11 BSSAP+-LOCATION-UPDATE-REQUEST message

This message is sent by the SGSN to the VLR either to request update of its location file (normal update) or to request IMSI attach.

Table 17.1.11/GSM 29.018: BSSAP+-LOCATION-UPDATE-REQUEST message content

Information Element	Type/Reference	Presence	Format	Length
Message type	Message type 18.2	M	V	1
IMSI	IMSI 18.4.10	M	TLV	6-10
SGSN number	SGSN number 18.4.22	M	TLV	5-11
Update type	GPRS location update type 18.4.6	M	TLV	3
New Cell global identity	Cell global identity 18.4.1	M	TLV	10
Mobile station classmark	Moblie station classmark 1 18.4.18	M	TLV	3
Old location area identifier	Location area identifier 18.4.14	O	TLV	7
TMSI status	TMSI status 18.4.24	O	TLV	3
New service area identification	Service area identification 18.4.21b	O	TLV	10

17.1.11.1 Old location area identifier

This information element should be included. It is derived from the old routing area identification received in the ROUTING AREA UPDATING REQUEST message defined in GSM 04.08.

17.1.11.2 New cell global identity

In GSM, ~~The~~ the cell global identity which shall be included is the one where the MS is in the current radio contact.

In UMTS, the cell global identity which shall be included indicates where the MS is in the current location area. The cell identity part of this information shall be ignored by the VLR.

17.1.11.3 TMSI status

This information element shall be included if the TMSI status received in the ATTACH REQUEST or ROUTING AREA UPDATING REQUEST message from the MS indicates, that no valid TMSI is available in the MS.

17.1.11.4 New service area identification

In UMTS, the service area identification which should be included is the one where the MS is in the current radio contact.

Next modification

17.1.14 BSSAP+-MS-ACTIVITY-INDICATION message

This message is sent by the SGSN to the VLR to indicate that activity from an MS has been detected.

Table 17.1.14/GSM 29.018: BSSAP+-MS-ACTIVITY-INDICATION message content

Information Element	Type/Reference	Presence	Format	Length
Message type	Message type 18.2	M	V	1
IMSI	IMSI 18.4.10	M	TLV	6-10
Cell global identity	Cell global identity 18.4.1	O	TLV	10
Service area identification	Service area identification 18.4.21b	O	TLV	10

17.1.14.1 Cell global identity (GSM only)

In GSM, ~~The~~ the SGSN shall include the cell global identity where the MS was in the last radio contact.

17.1.14.2 Service area identification (UMTS only)

In UMTS, the SGSN should include the Service area identification where the mobile was in the last radio contact.

Next modification

17.1.16 BSSAP+-MS-INFORMATION-RESPONSE message

This message is sent from the SGSN to the VLR as a response to a previous BSSAP+- MS-INFORMATION -REQUEST message. (At least one of the requested identities shall be sent).

Table 17.1.16/GSM 29.018: BSSAP+-MS-INFORMATION-RESPONSE message content

Information Element	Type/Reference	Presence	Format	Length
Message type	Message type 18.2	M	V	1
IMSI	IMSI 18.4.10	M	TLV	6-10
TMSI	TMSI 18.4.23	O	TLV	6
PTMSI	PTMSI 18.4.20	O	TLV	6
IMEI	IMEI 18.4.8	O	TLV	10
IMEISV	IMEISV 18.4.9	O	TLV	10
Cell global identity	Cell global identity 18.4.1	O	TLV	10
Location information age	Location information age 18.4.15	O	TLV	4
Mobile station state	Mobile station state 18.4.19	O	TLV	3
Service area identification	Service area identification 18.4.21b	O	TLV	10

17.1.16.1 IMEI

This information element should be included if it was requested in the BSSAP+-MS-INFORMATION-REQUEST message and if this information is obtainable.

17.1.16.2 IMIESV

This information element should be included if it was requested in the BSSAP+-MS-INFORMATION-REQUEST message and if this information is obtainable.

17.1.16.3 Cell global identity (GSM only)

In GSM, ~~Cell~~ cell global identity where the MS was in the last radio contact.

This information element should be included if it was requested in the BSSAP+-MS-INFORMATION-REQUEST message and if this information is obtainable.

17.1.16.4 Location information age

Time in minutes since the MS last established a radio transaction.

This information element should be included if it was requested in the BSSAP+-MS-INFORMATION-REQUEST message and if this information is obtainable.

17.1.16.5 Mobile station state

This information element should be included in this message, irrespective of the information requested.

17.1.16.6 TMSI

This information element should be included if it was requested in the BSSAP+-MS-INFORMATION-REQUEST message and if this information is obtainable.

17.1.16.7 Service area identification (UMTS only)

In UMTS, service area identification where the MS was in the last radio contact.

This information element should be included if it was requested in the BSSAP+-MS-INFORMATION-REQUEST message and if this information is obtainable.

Next modification

17.1.22 BSSAP+-TMSI-REALLOCATION-COMPLETE message

This message is sent by the SGSN to the VLR to indicate that TMSI reallocation or deletion on the MS has been successfully completed.

Table 17.1.22/GSM 29.018: BSSAP+-TMSI-REALLOCATION-COMPLETE message content

Information Element	Type/Reference	Presence	Format	Length
Message type	Message type 18.2	M	V	1
IMSI	IMSI 18.4.10	M	TLV	6-10
Cell global identity	Cell global identity 18.4.1	O	TLV	10
Service area identification	Service area identification 18.4.21b	O	TLV	10

17.1.22.1 Cell global identity (GSM only)

The SGSN shall include the cell global identity where the Mobile Station was in the last radio contact.

17.1.22.2 Service area identification (UMTS only)

In UMTS, the SGSN should include the Service area identification where the mobile was in the last radio contact.

Next modification

18.3 Information Element Identifiers

The next list shows the coding of the Information Element Identifiers used in the present document.

Table 18.3/GSM 29.018: Information Element Identifier coding

8 7 6 5 4 3 2 1	**Information element**	*Reference*
0 0 0 0 0 0 0 1	IMSI	*18.4.10*
0 0 0 0 0 0 1 0	VLR number	*18.4.26~~5~~*
0 0 0 0 0 0 1 1	TMSI	*18.4.23*
0 0 0 0 0 1 0 0	Location area identifier	*18.4.14*
0 0 0 0 0 1 0 1	Channel Needed	*18.4.2*
0 0 0 0 0 1 1 0	EMLPP Priority	*18.4.4*
0 0 0 0 0 1 1 1	TMSI status	*18.4.24*
0 0 0 0 1 0 0 0	Gs cause	*18.4.7*
0 0 0 0 1 0 0 1	SGSN number	*18.4.22*
0 0 0 0 1 0 1 0	GPRS location update type	*18.4.6*
0 0 0 0 1 0 1 1	*Unassigned:* treated as an unknown IEI.	*18&16*
0 0 0 0 1 1 0 0	*Unassigned:* treated as an unknown IEI.	*18&16*
0 0 0 0 1 1 0 1	Mobile station classmark 1	*18.4.18*
0 0 0 0 1 1 1 0	Mobile identity	*18.4.17*
0 0 0 0 1 1 1 1	Reject cause	*18.4.21*
0 0 0 1 0 0 0 0	IMSI detach from GPRS service type	*18.4.11*
0 0 0 1 0 0 0 1	IMSI detach from non-GPRS service type	*18.4.12*
0 0 0 1 0 0 1 0	Information requested	*18.4.13*
0 0 0 1 0 0 1 1	PTMSI	*18.4.20*
0 0 0 1 0 1 0 0	IMEI	*18.4.8*
0 0 0 1 0 1 0 1	IMEISV	*18.4.9*
0 0 0 1 0 1 1 0	*Unassigned:* treated as an unknown IEI.	*18&16*
0 0 0 1 0 1 1 1	MM information	*18.4.16*
0 0 0 1 1 0 0 0	Cell Global Identity	*18.4.1*
0 0 0 1 1 0 0 1	Location information age	*18.4.15*
0 0 0 1 1 0 1 0	Mobile station state	*18.4.19*
0 0 0 1 1 0 1 1	Erroneous message	*18.4.5*
0 0 0 1 1 1 0 0	Downlink Tunnel Payload Control and Info	*18.4.3*
0 0 0 1 1 1 0 1	Uplink Tunnel Payload Control and Info	*18.4.~~24~~25*
0 0 0 1 1 1 1 0	Service Area Identification	*18.4.21b*
0 0 0 1 1 1 1 ~~0~~1 to 1 1 1 1 1 1 1 1	*Unassigned:* treated as an unknown IEI.	*18&16*

Next modification

18.4 Information elements

18.4.21b Service Area Identification

This information element uniquely identifies one service area.

	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2	Length indicator							
Octet 3 to Octet 10	The rest of the information element is coded as the the value part of the SAI IE defined in 3G TS 25.413 (not including 3G TS 25.413 IEI and 3G TS 25.413 length indicator).							

Figure 18.4.27/GSM 29.018: Service Area Identification IE

3GPP/SMG Meeting #11
Umea, Sweden, 28 February - 03 March 2000

Document ***N1-000516***

Revision of N1-000292

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

24.011	CR	004r1	Current Version:	3.1.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to: TSG CN#7 *list expected approval meeting # here ↑*

for approval [X] for information [ ]

strategic [ ] non-strategic [ ] *(for SMG use only)*

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available*

Proposed change affects: *(at least one should be marked with an X)* (U)SIM [ ] ME [X] UTRAN / Radio [ ] Core Network [X]

Source: CN1 **Date:** 2000-02-14

Subject: Reintroduction of deleted arrow diagrams

Work item: TEI

Category: *(only one category shall be marked with an X)*

F	Correction	[X]
A	Corresponds to a correction in an earlier release	[ ]
B	Addition of feature	[ ]
C	Functional modification of feature	[ ]
D	Editorial modification	[ ]

Release:

Phase 2	[ ]
Release 96	[ ]
Release 97	[ ]
Release 98	[ ]
Release 99	[X]
Release 00	[ ]

Reason for change: Two arrow diagrams and SMC-CP SDLs were removed from GSM 04.11 somewhere between version 5.x.x and 6.0.0. These are now reintroduced as they were never meant to be deleted.

Clauses affected: Annex A; Annex B

Other specs affected:

Other 3G core specifications	[ ]	→ List of CRs:
Other GSM core specifications	[ ]	→ List of CRs:
MS test specifications	[ ]	→ List of CRs:
BSS test specifications	[ ]	→ List of CRs:
O&M specifications	[ ]	→ List of CRs:

Other comments:

Annex A (informative): Arrow diagrams

Arrow diagram A1:

The diagram shows CS MO-message transfer by means of interlayer service primitives and the actual messages being transferred between the layer entities

Arrow diagram A2:

The diagram shows CS MT-messaging by means of interlayer service primitives and the actual messages being transferred between the layer entities in GSM.

Arrow diagram A5:

The diagram shows GPRS MO-message transfer by means of interlayer service primitives and the actual messages being transferred between the layer entities.

- MNSMS-primitives indicate services provided by CM to SM-RL.
- LLSMS-primitives indicate services provided by LLC to CM.
- CP-DATA is the CM-message carrying SM-RP data units.
- CP-ACK acknowledge CP-DATA reception on CM.

Arrow diagram A6:

The diagram shows GPRS MT-message transfer by means of interlayer service primitives and the actual messages being transferred between the layer entities in GSM.

- MNSMS-primitives indicate services provided by CM to SM-RL.
- LLSMS-primitives indicate services provided by LLC to CM.
- CP-DATA is the CM-message carrying SM-RP data units.
- CP-ACK acknowledge CP-DATA reception on CM.

Arrow diagram A7:

The diagram shows UMTS PS MO-message transfer by means of interlayer service primitives and the actual messages being transferred between the layer entities

- MNSMS-primitives indicate services provided by CM to SM-RL.
- PMMSMS-primitives indicate services provided by GMM to CM.
- CP-DATA is the CM-message carrying SM-RP data units.
- CP-ACK acknowledge CP-DATA reception on CM.

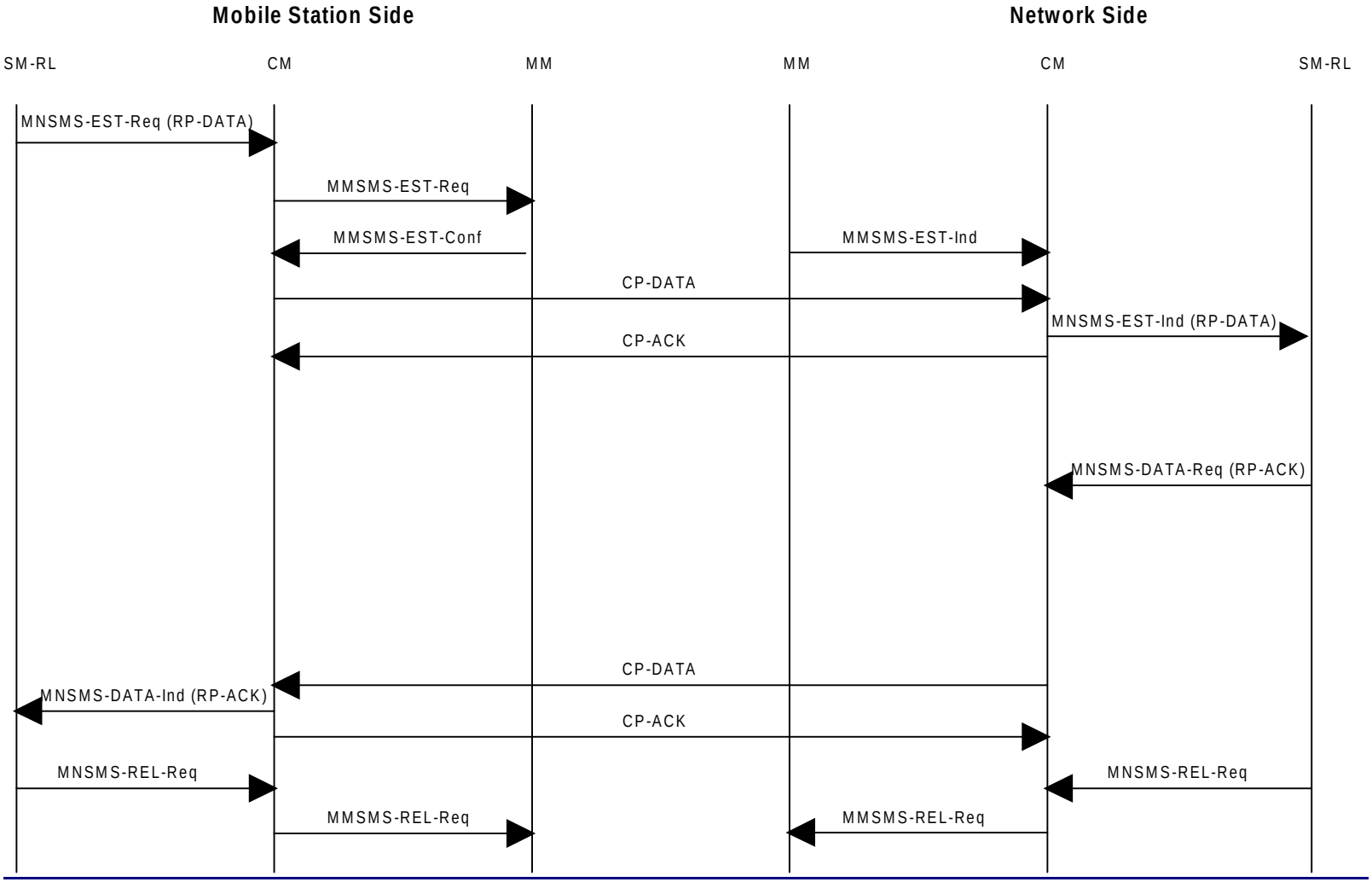
Arrow diagram A8:

The diagram shows UMTS PS MT-messaging by means of interlayer service primitives and the actual messages being transferred between the layer entities

- MNSMS-primitives indicate services provided by CM to SM-RL.
- PMMSMS-primitives indicate services provided by GMM to CM.
- CP-DATA is the CM-message carrying SM-RP data units.

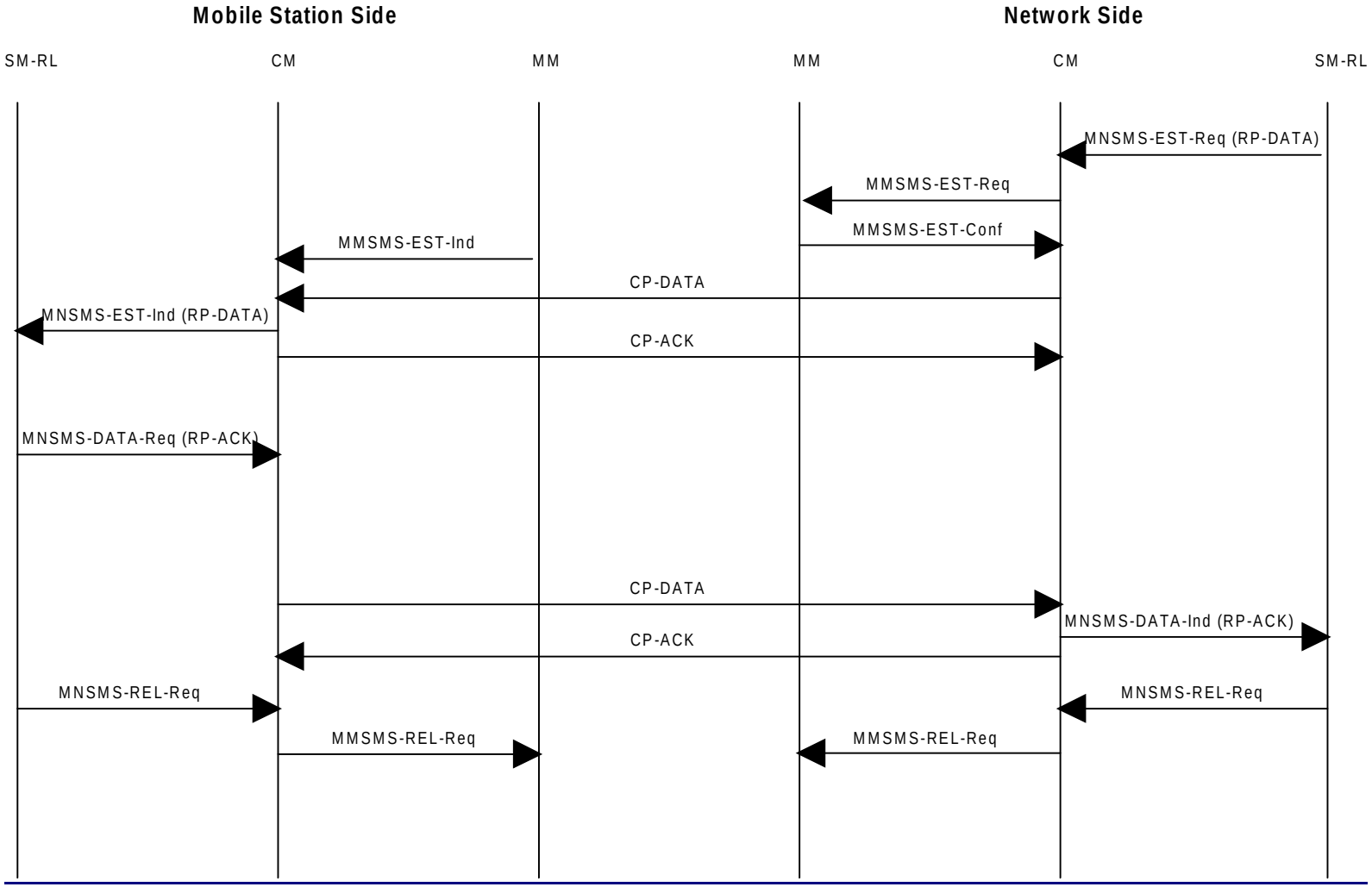
CP-ACK acknowledge CP-DATA reception on CM.

Mobile Originated Messaging on CM-sublayer



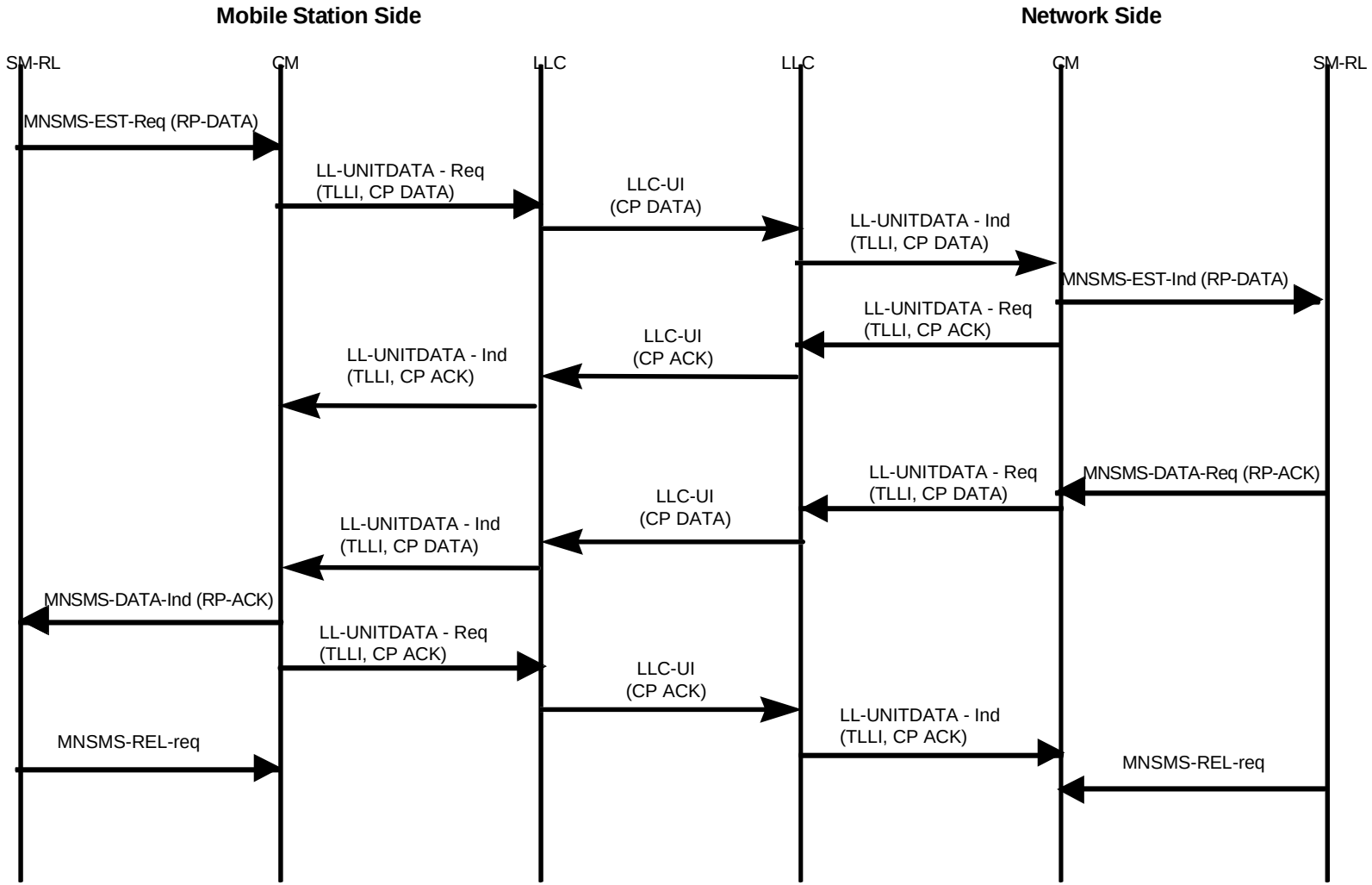
Arrow diagram A1

Mobile Terminated Messaging on CM-sublayer



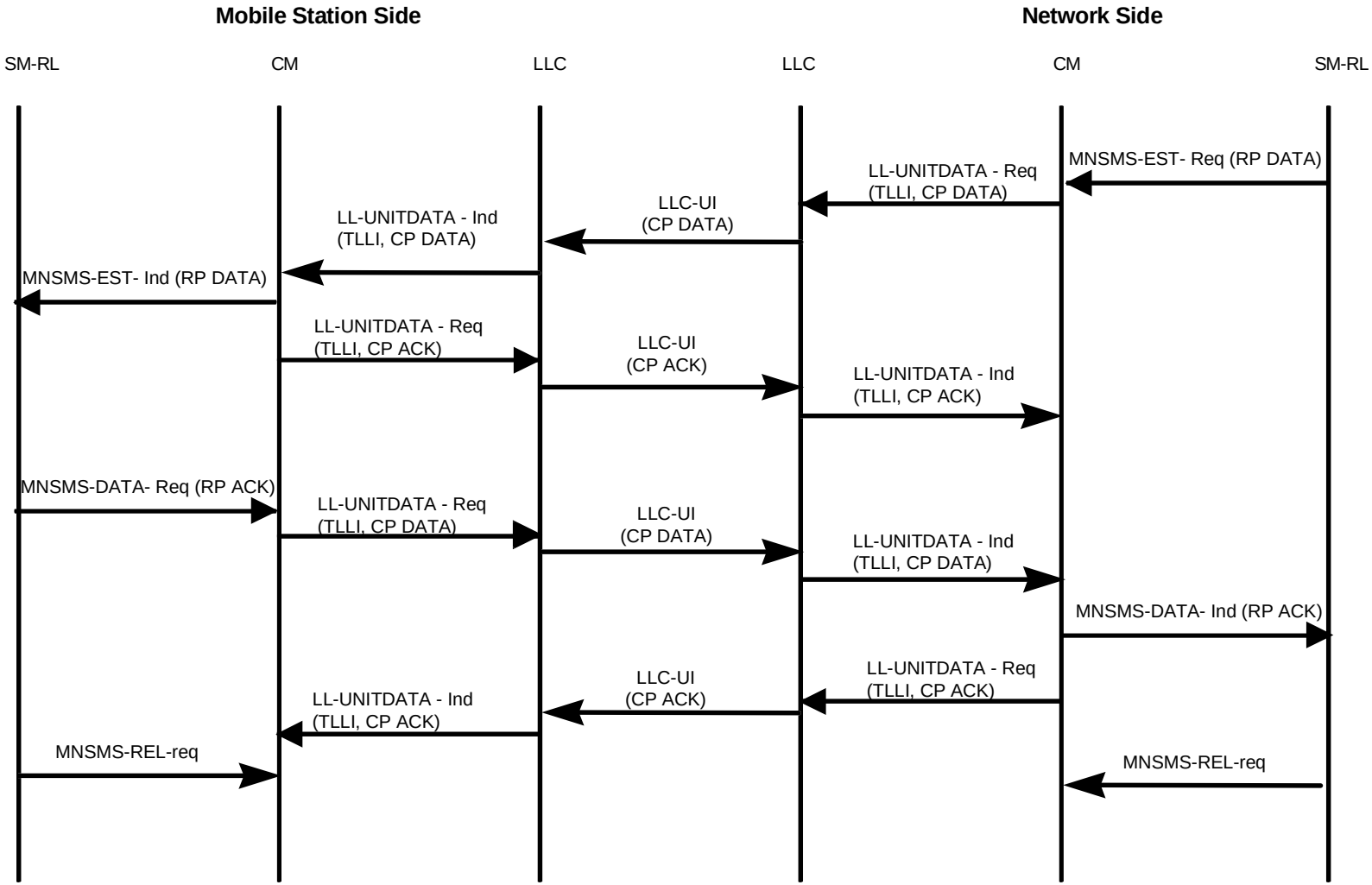
Arrow diagram A2

GPRS Mobile Originated Messaging on CM-sublayer in GSM



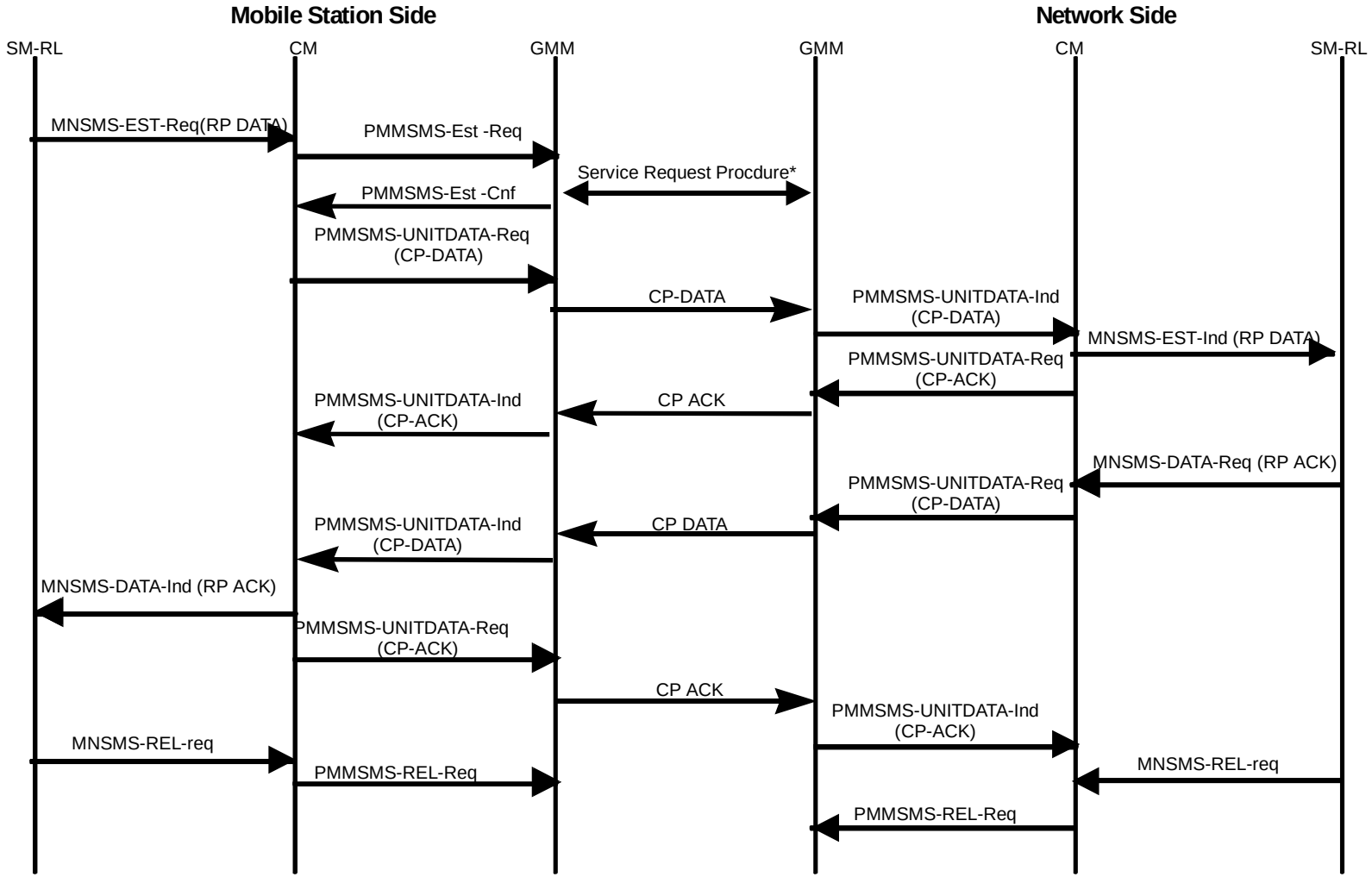
Arrow diagram A5

GPRS Mobile Terminated Messaging on CM-sublayer in GSM



Arrow diagram A6

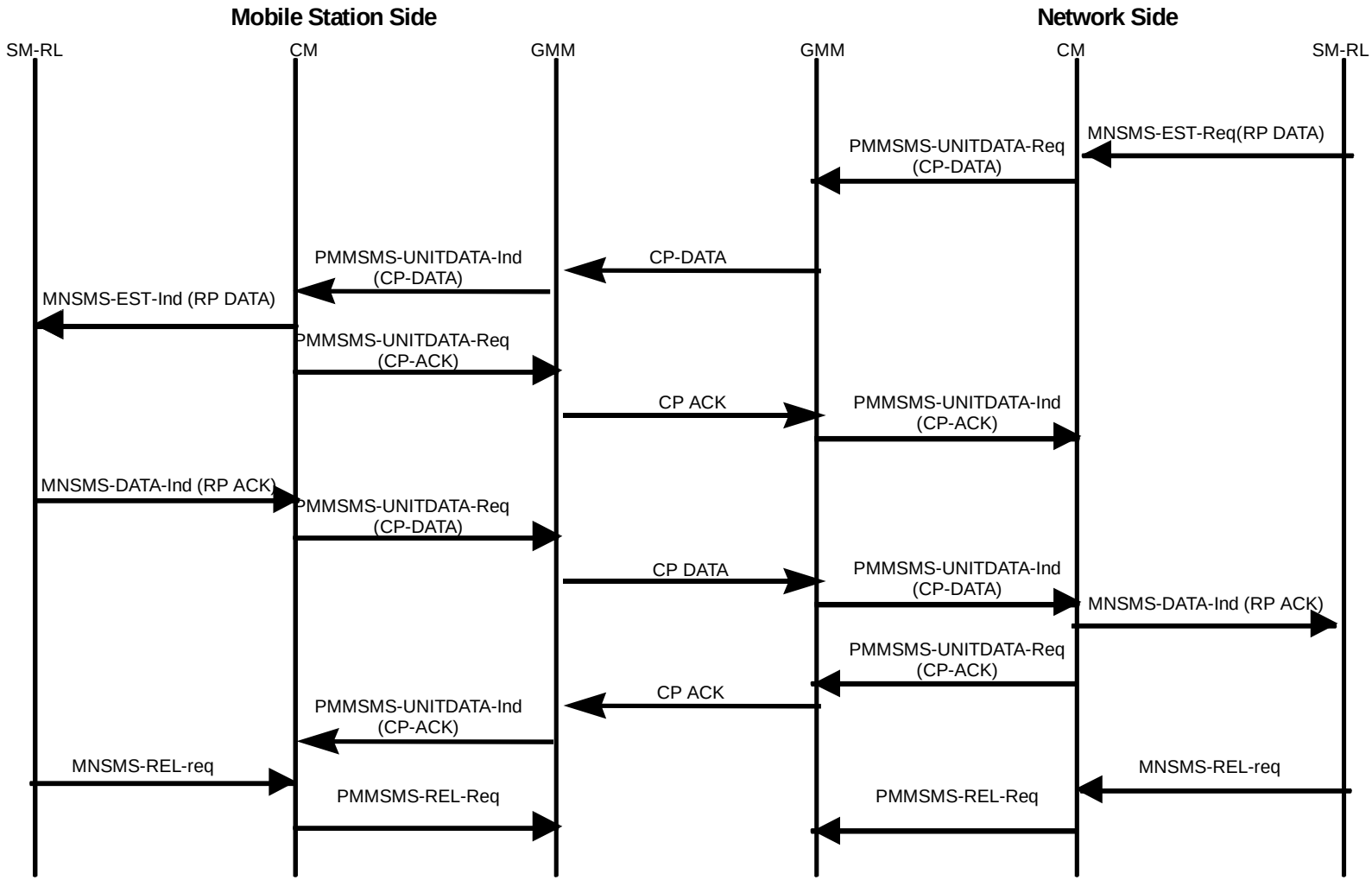
GPRS Mobile Originated Messaging on CM-sublayer in UMTS



Note: Service Request Procedure may not be initiated.

Arrow diagram A7

GPRS Mobile Terminated Messaging on CM-sublayer in UMTS



Arrow diagram A8

Annex B (normative):
SDL-description of the CM-layer

B.1 Introduction

This annex contains an SDL-description of the Connection Management Sublayer in terms of the Short Message Service Support. The CM- sublayer provides services to Short Message Relay Layer.

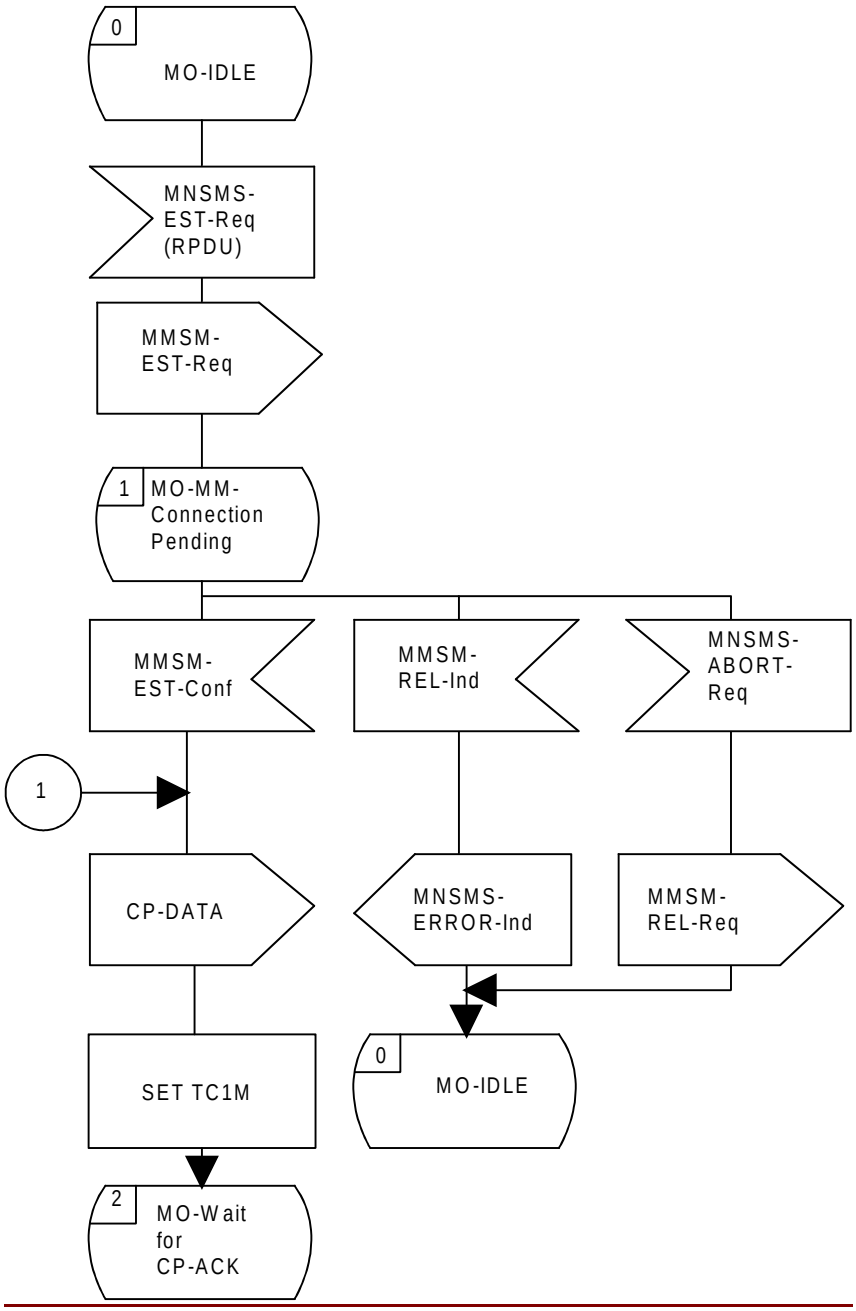
The SDLs contain a mixture of peer to peer messages and conceptual primitives between the layers SM-RL, CM, MM and LLC, as viewed by the SMC entities. SDL-1/2/3 show the CS SMC entity on MS-side for Mobile Originated (MO) short message transfer, SDL-4/5/6 show the CS SMC entity on MS-side for Mobile Terminated (MT) short message transfer, SDL-7/8/9 show the CS SMC entity on the network side for Mobile Originated (MO) short message transfer, and SDL-10/11/12 show the CS SMC entity on the network side for Mobile Terminated (MT) short message transfer.

SDL-13/14/15 show the GPRS SMC entity on MS-side for Mobile Originated (MO) short message transfer, [FFS: These diagrams don't show new UMTS state.]

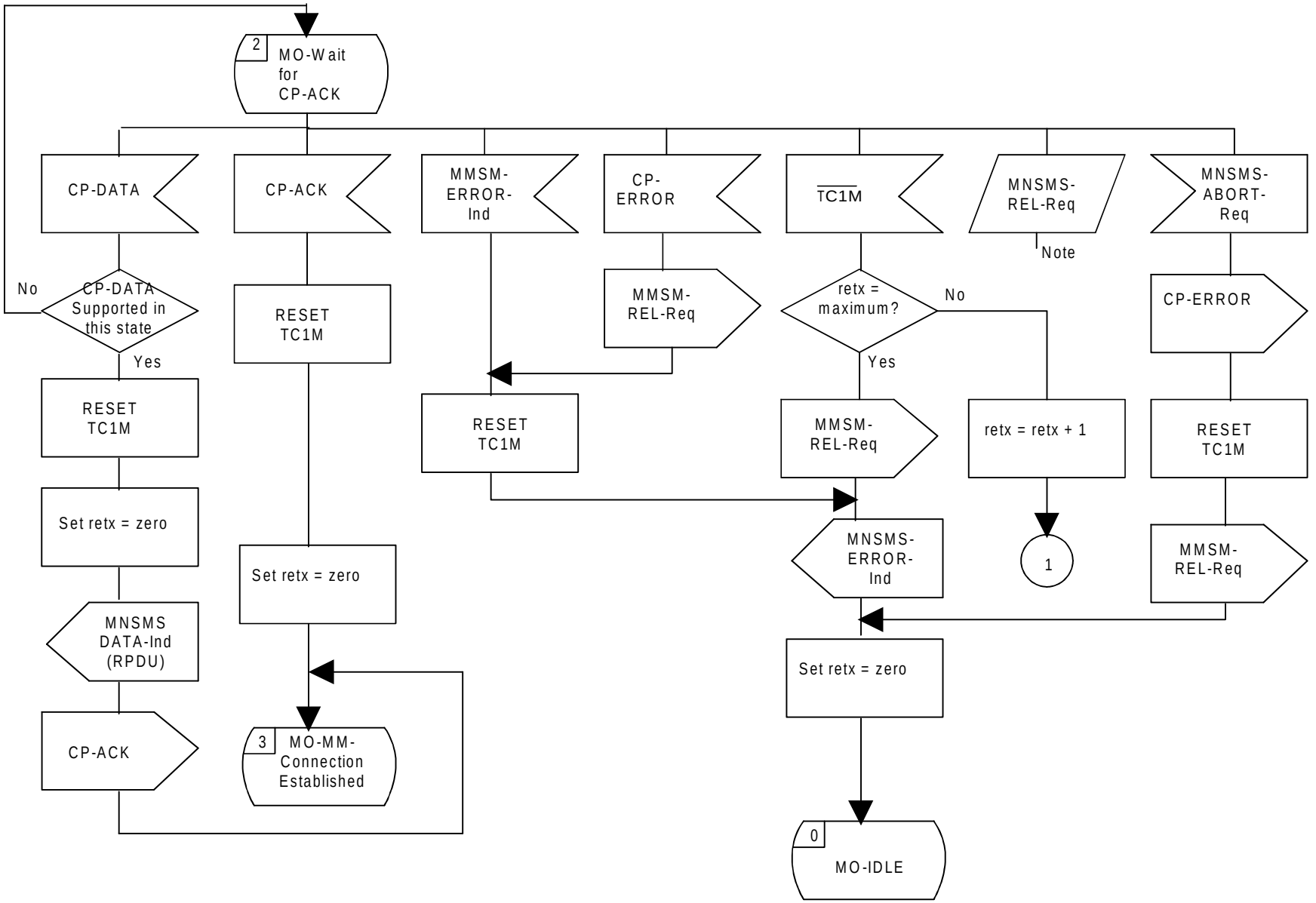
SDL-16/17/18 show the GPRS SMC entity on MS-side for Mobile Terminated (MT) short message transfer, SDL-19/20/21 show the GPRS SMC entity on the network side for Mobile Originated (MO) short message transfer, and SDL-22/23/24 show the GPRS SMC entity on the network side for Mobile Terminated (MT) short message transfer.

The lower layers (below MM, GMM and LLC) are transparent to an SMC entity.

~~Editors note: Please Change all the SDL 1-12 titles to include CS GSM~~

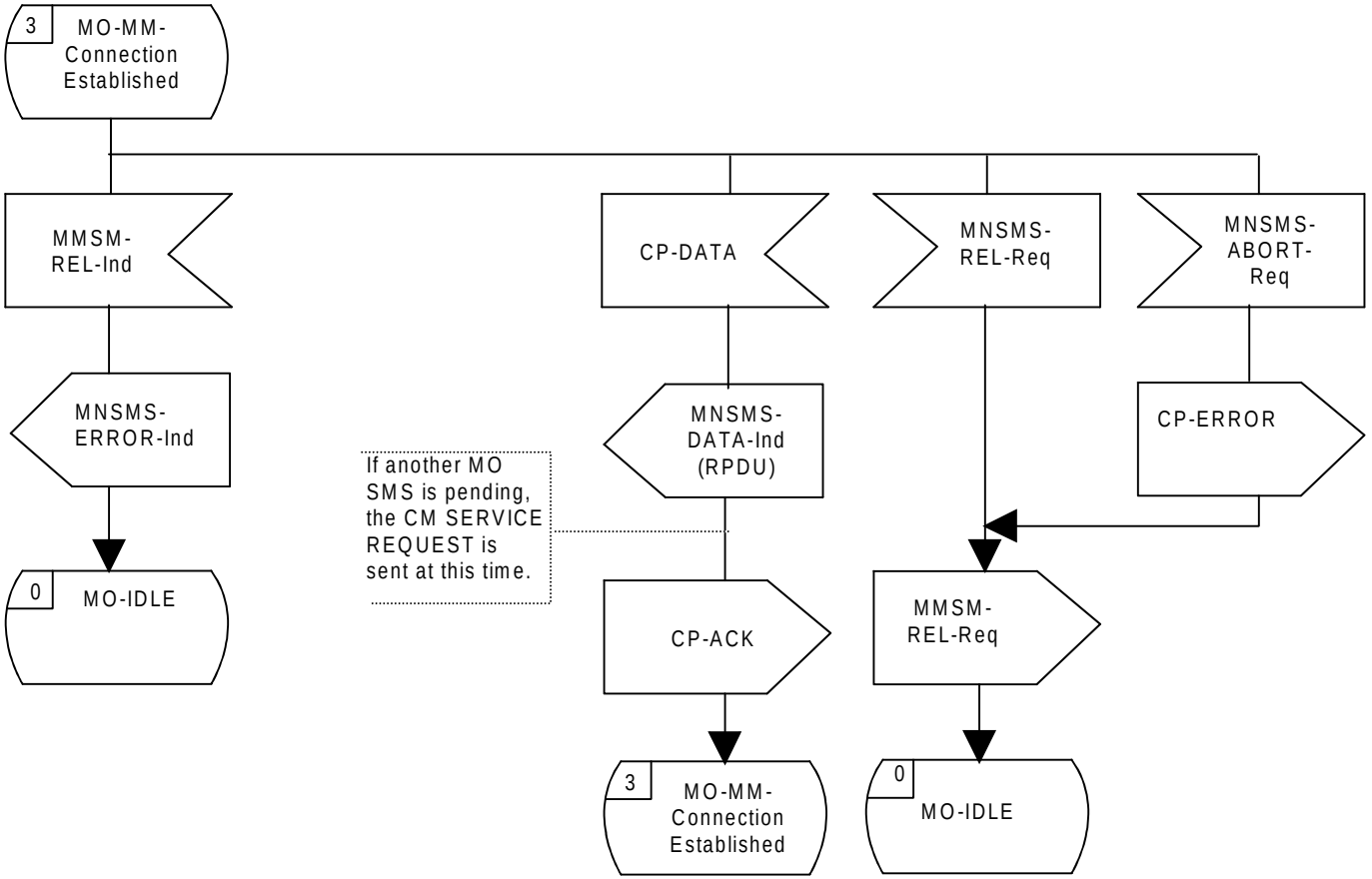


MO-SMC-CP-entity on MS-side
SDL-1

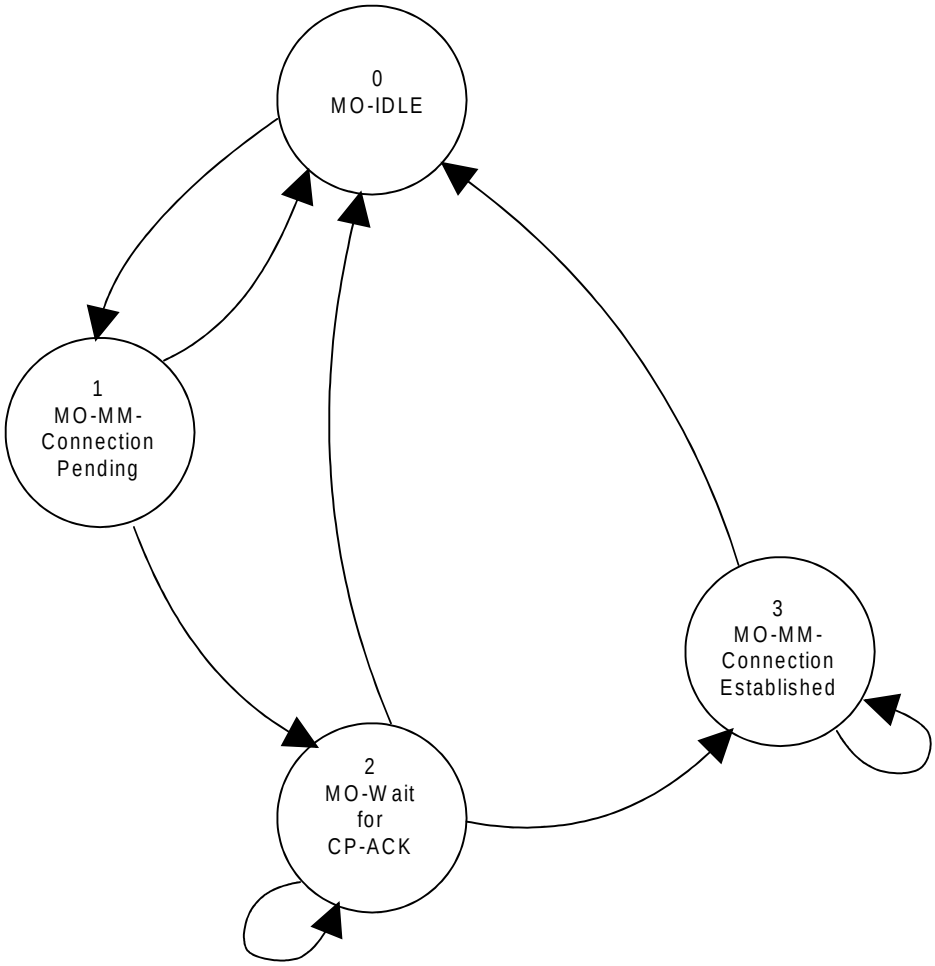


NOTE: The release is delayed until the next state.

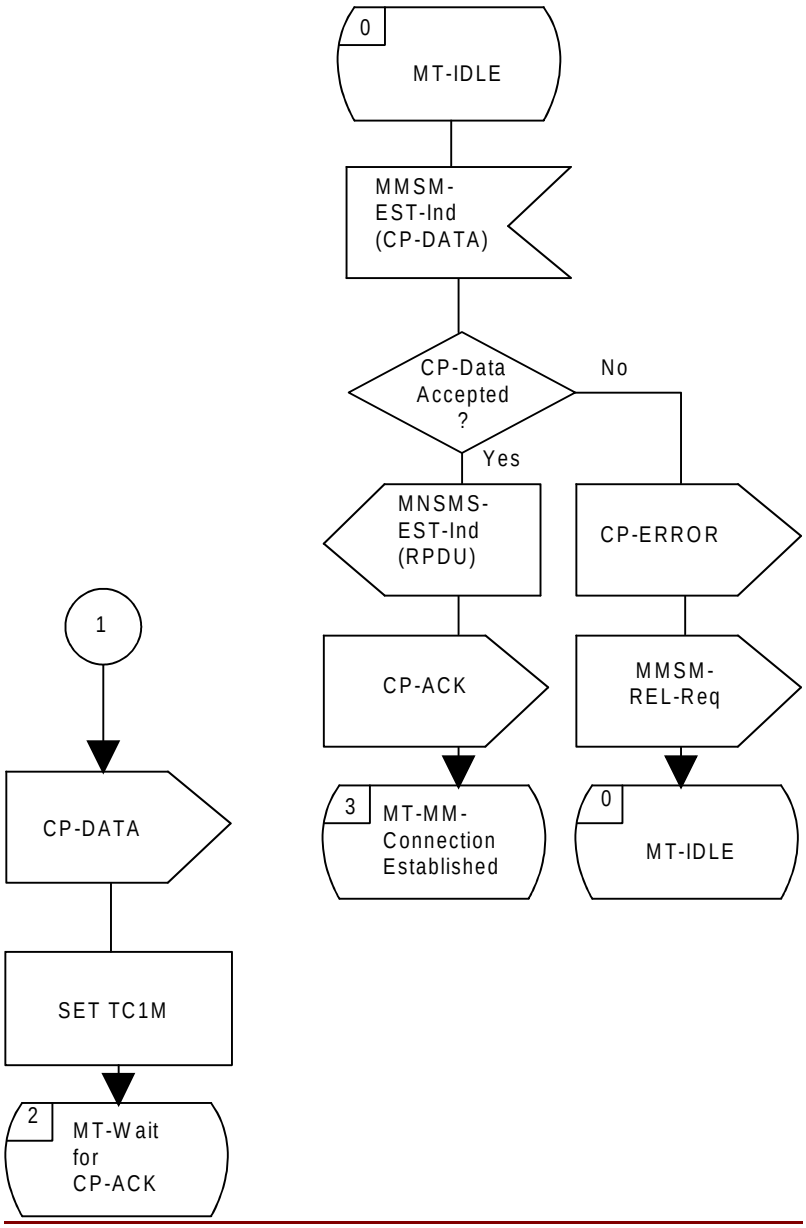
MO-SMC-CP-entity on MS-side
SDL-2



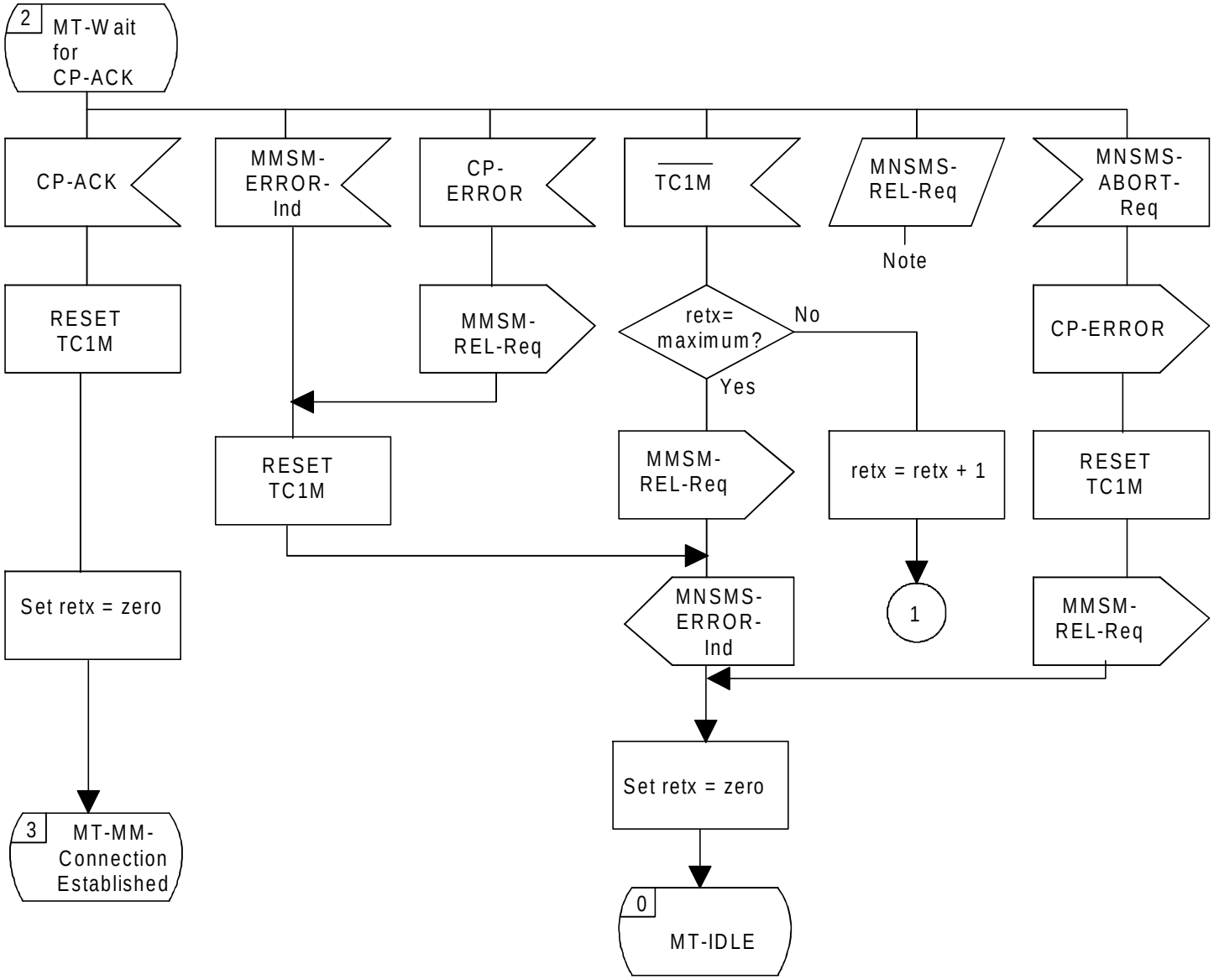
MO-SMC-CP-entity on MS-side
SDL-3



MO-SMC-CP-entity on MS-side
State transition diagram

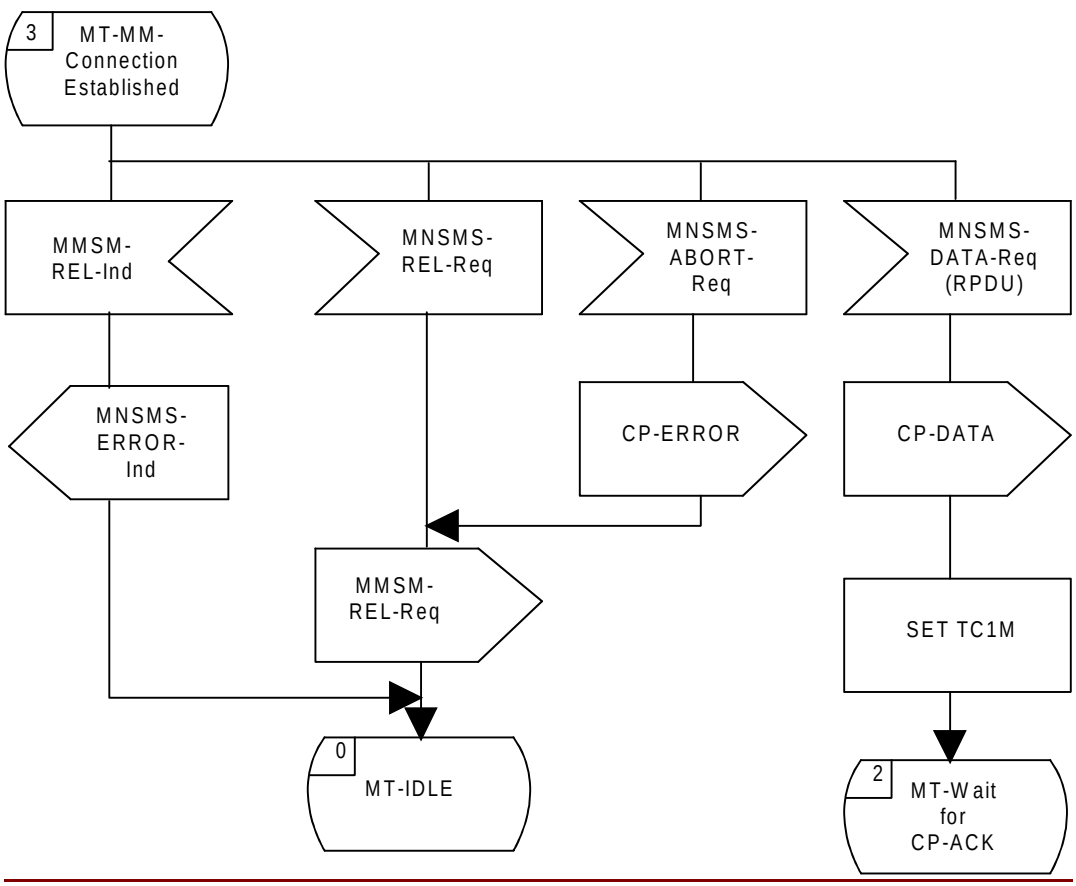


MT-SMC-CP-entity on MS-side
Initiating message transfer
SDL-4

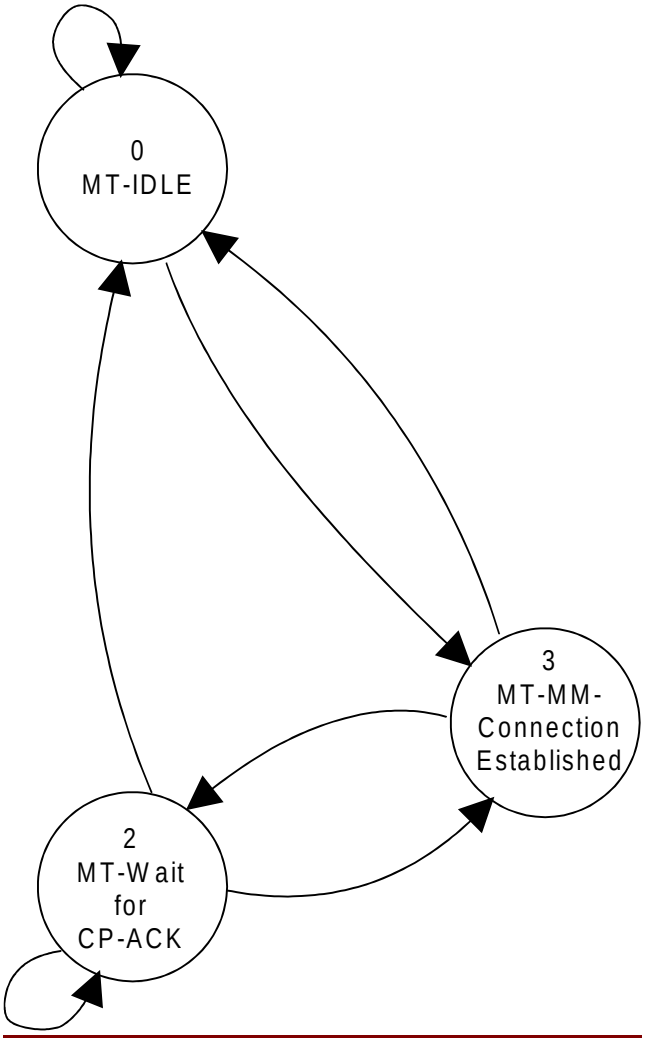


NOTE: The release is delayed until the next state.

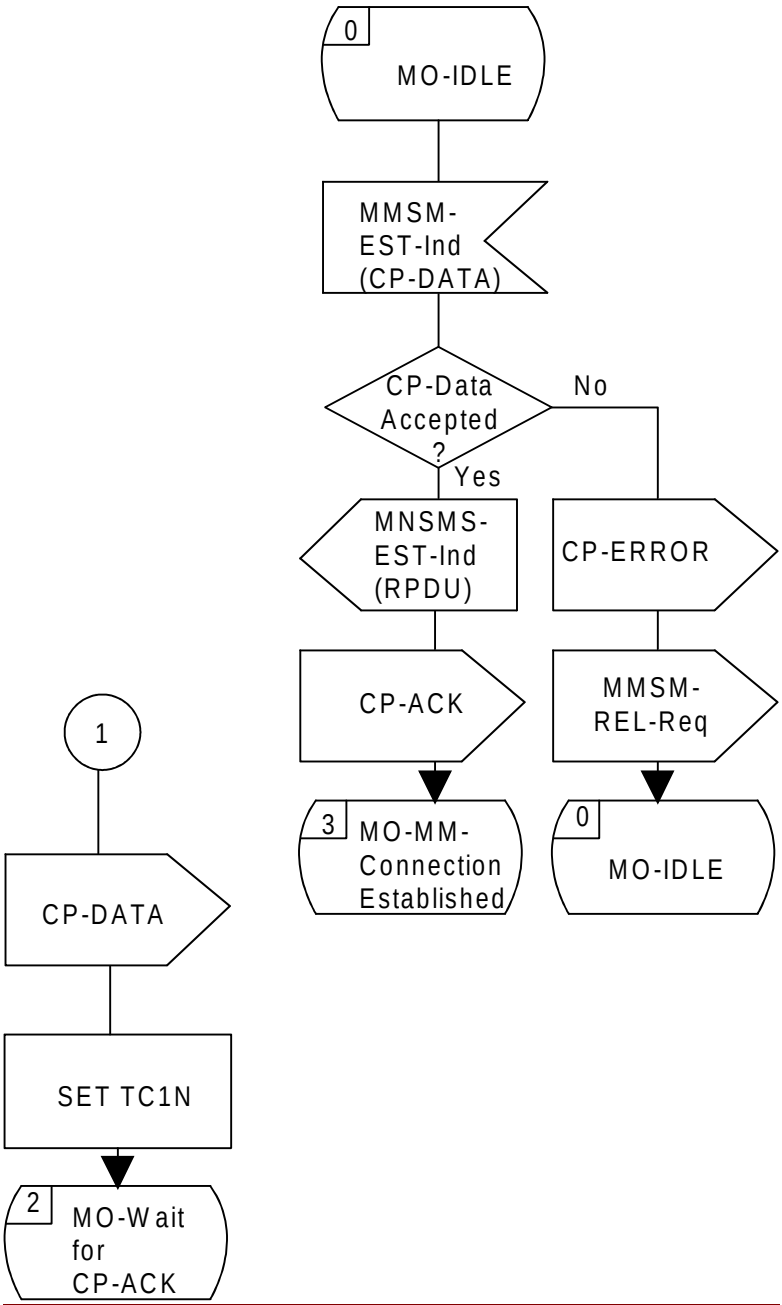
MT-SMC-CP-entity on MS-side
MM-connection established
SDL-5



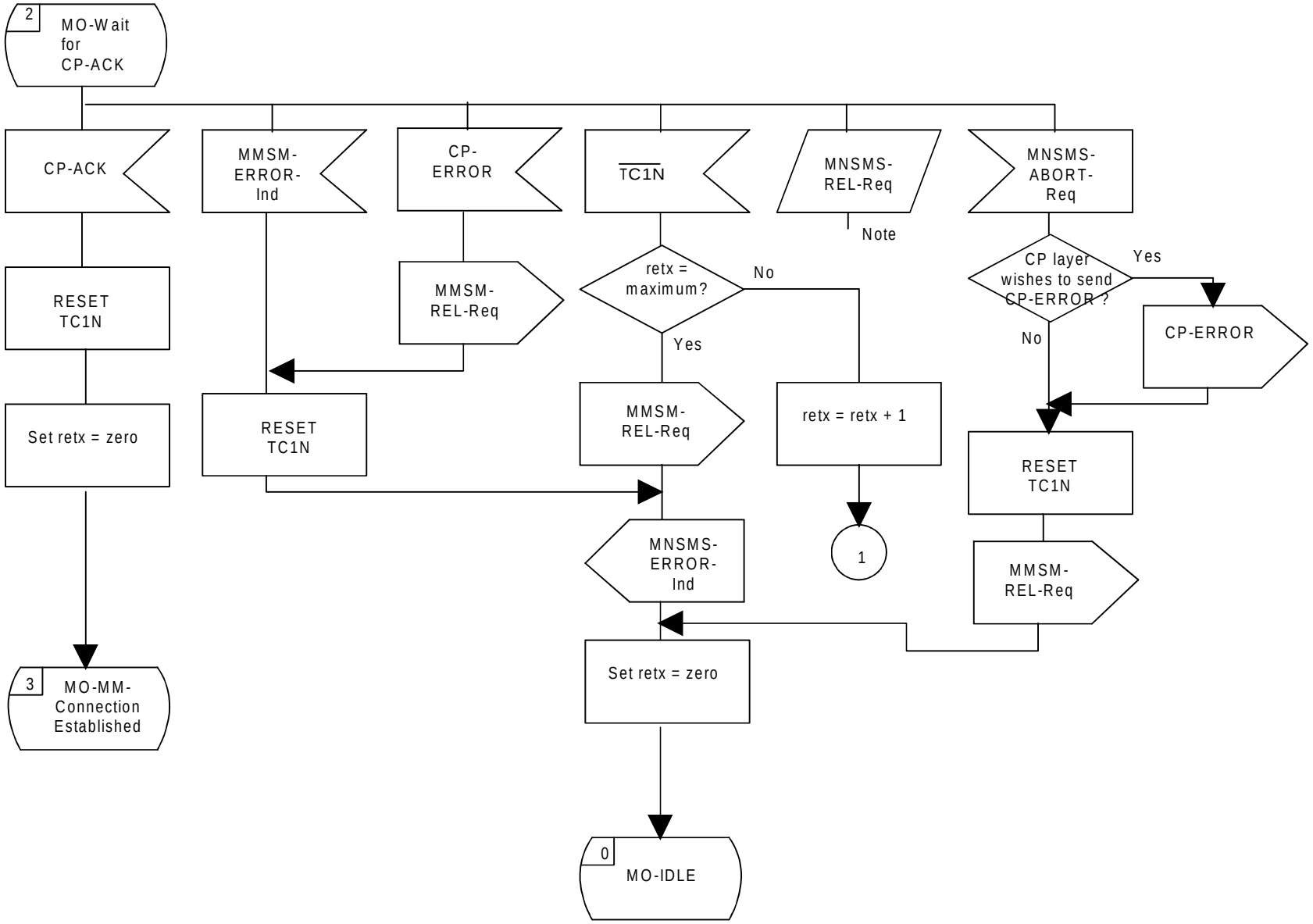
MT-SMC-CP-entity on MS-side
MM-connection released
SDL-6



MT-SMC-entity on MS-side
State transition diagram

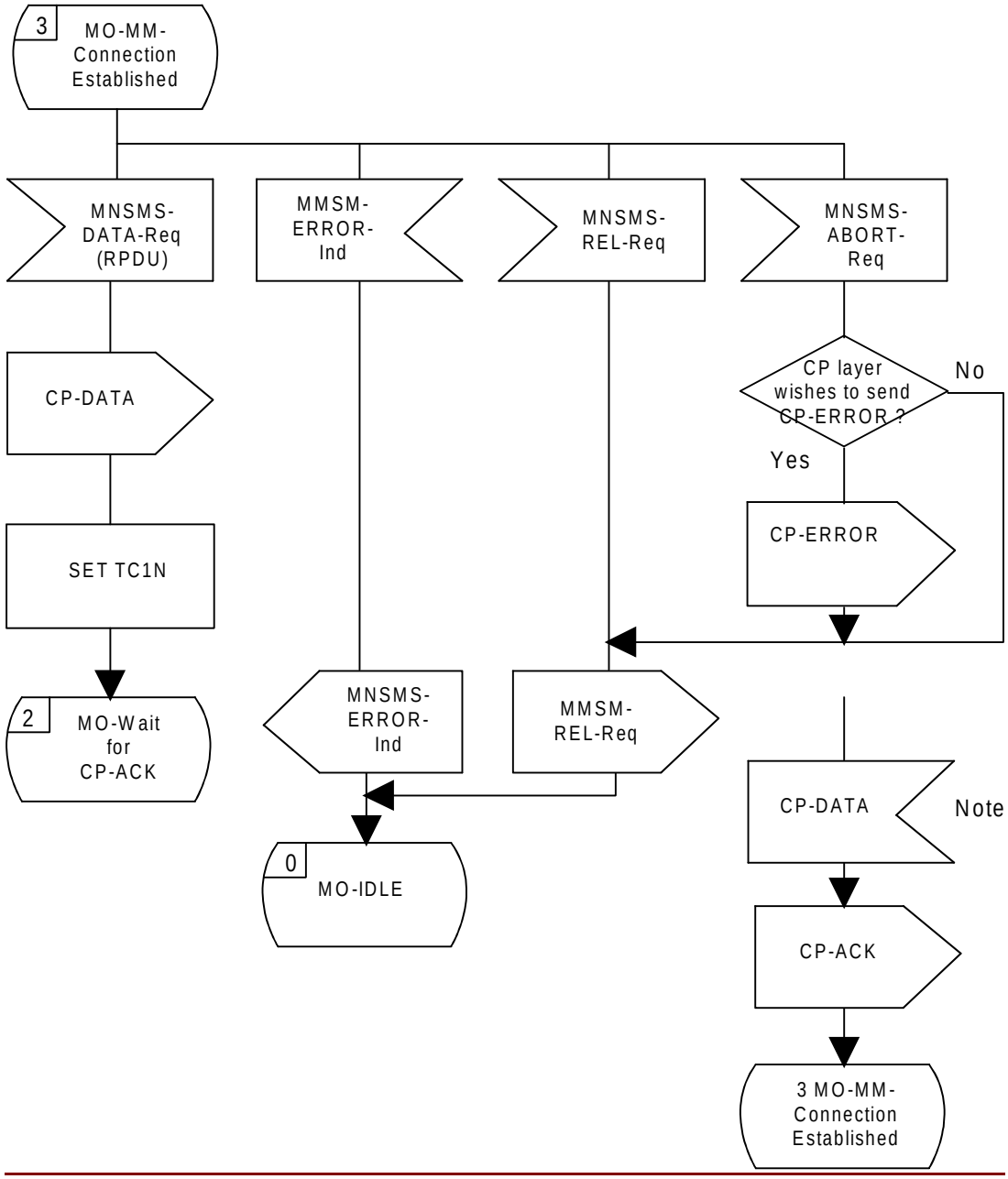


MO-SMC-CP-entity on Network-side
SDL-7



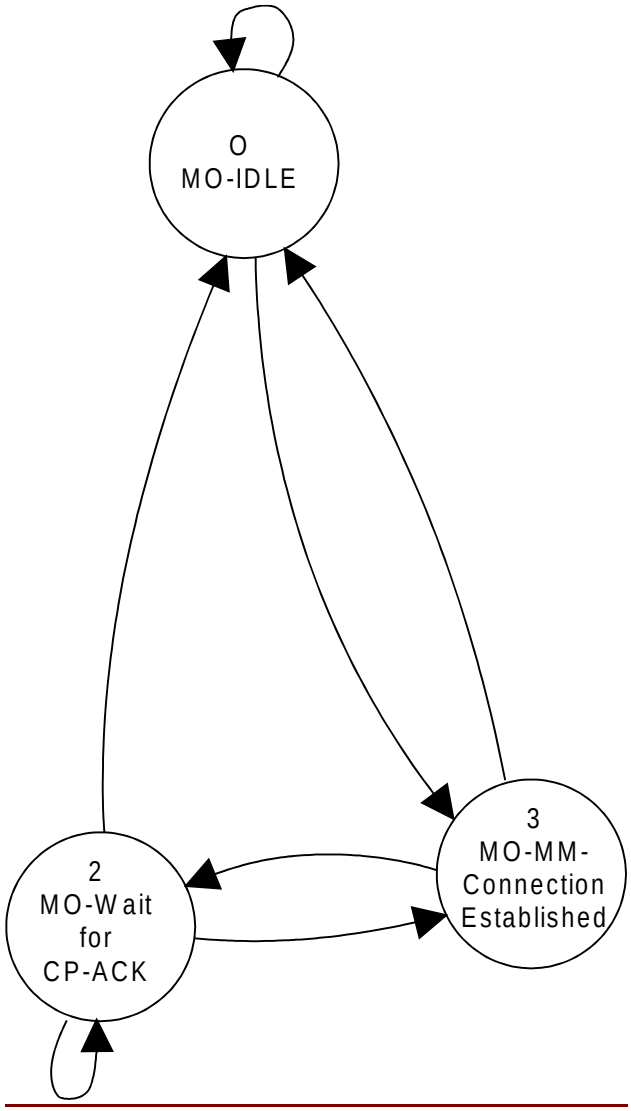
NOTE: The release is delayed until the next state.

MO-SMC-CP-entity on Network-side
SDL-8

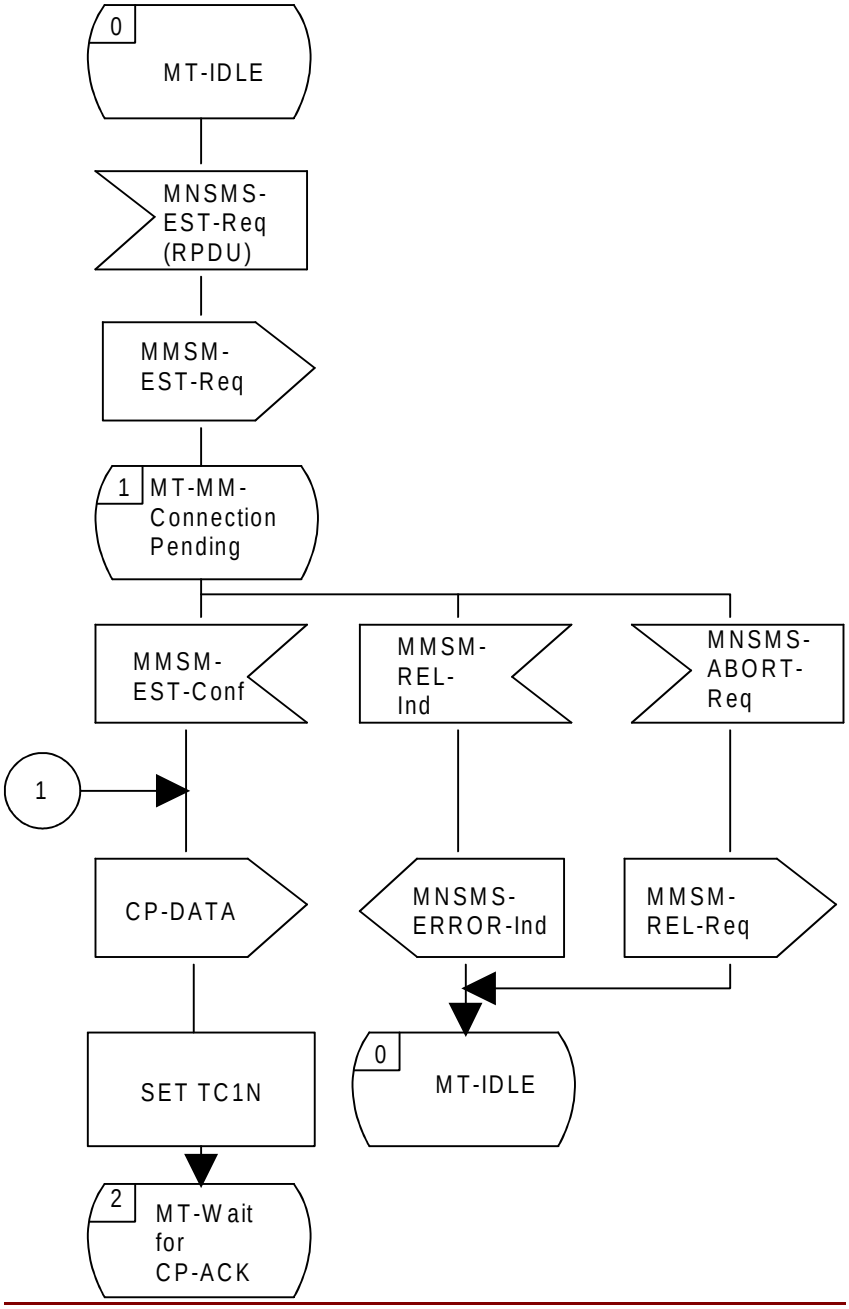


NOTE: This message is a retransmission from the MS.

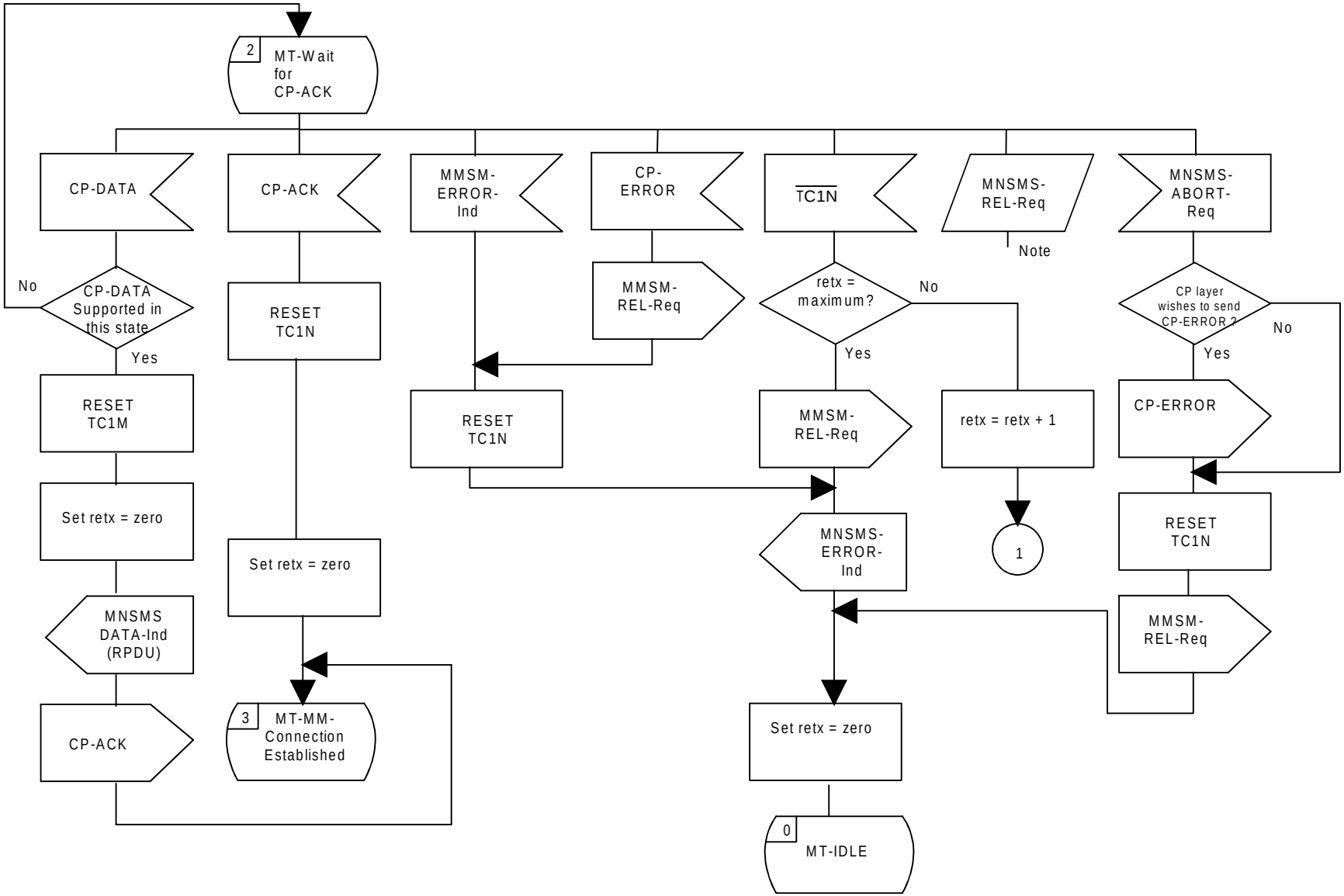
MO-SMC-CP-entity on Network-side
SDL-9



MO-SMC-CP-entity on Network-side
State transition diagram

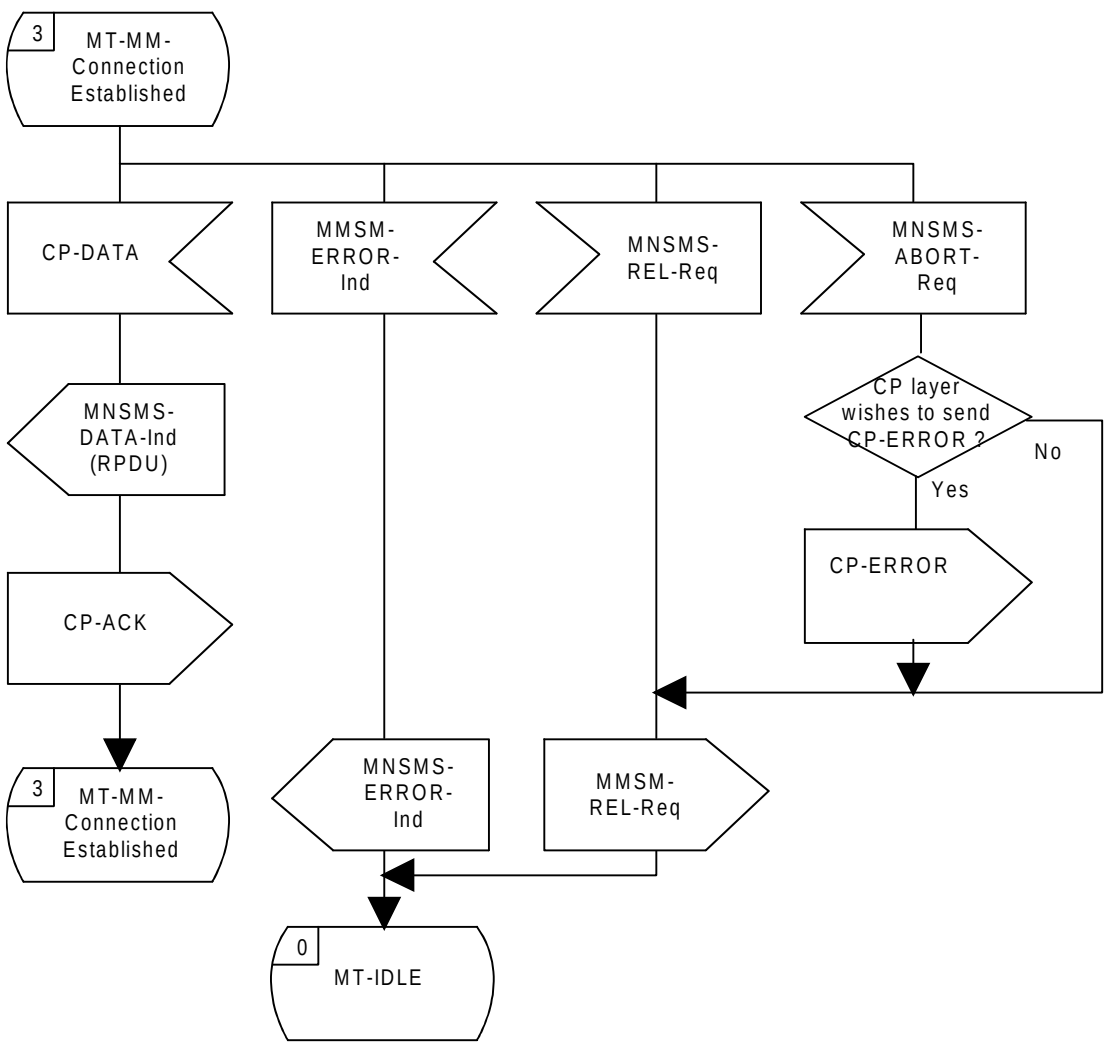


MT-SMC-CP-entity on Network-side
SDL-10

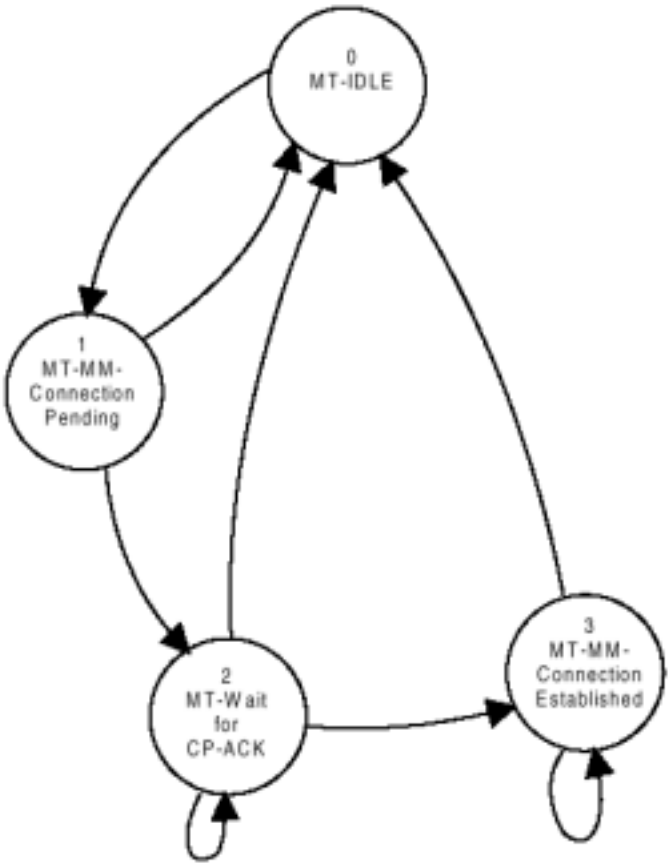


NOTE: The release is delayed until the next state.

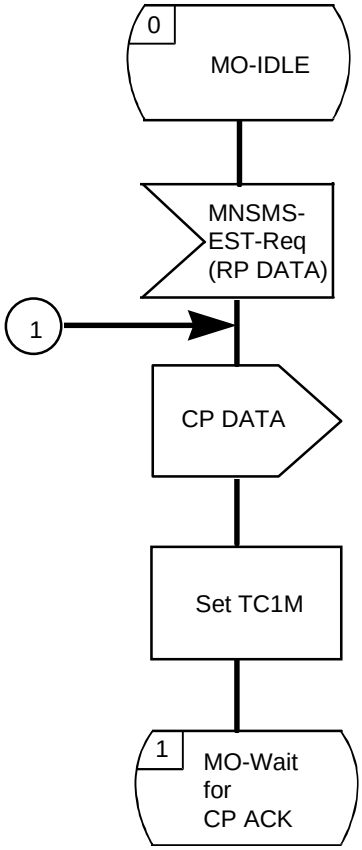
MT-SMC-entity on Network-side
MM-connection established
SDL-11



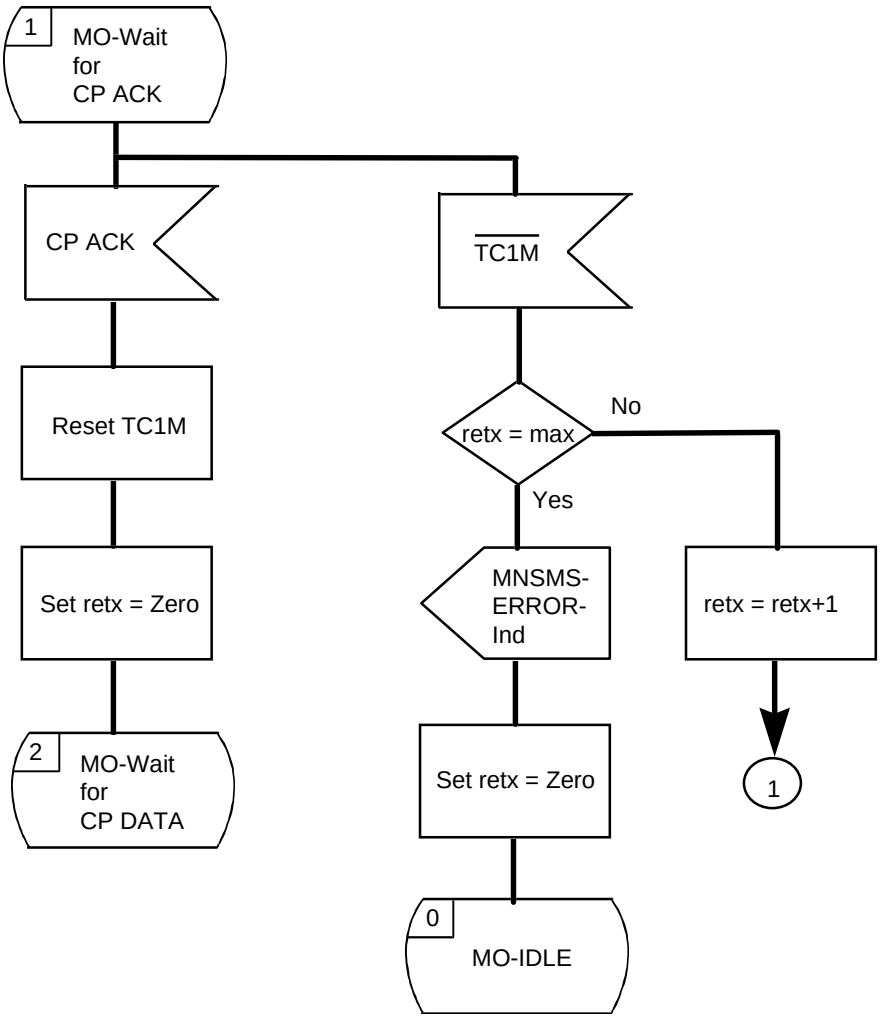
MT-SMC-CP-entity on Network-side
Message transfer active
SDL-12



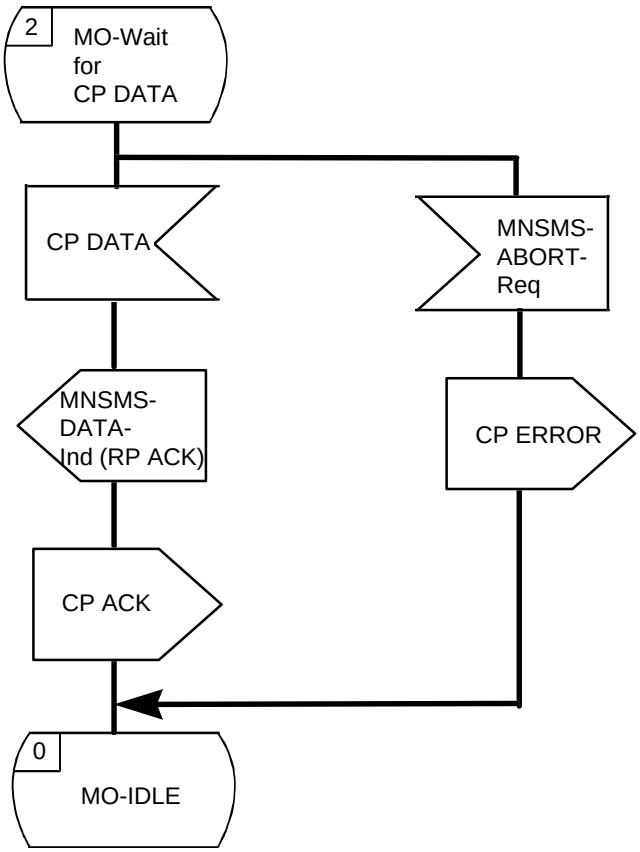
MT-SMC-CP-entity on Network-side
State transition diagram



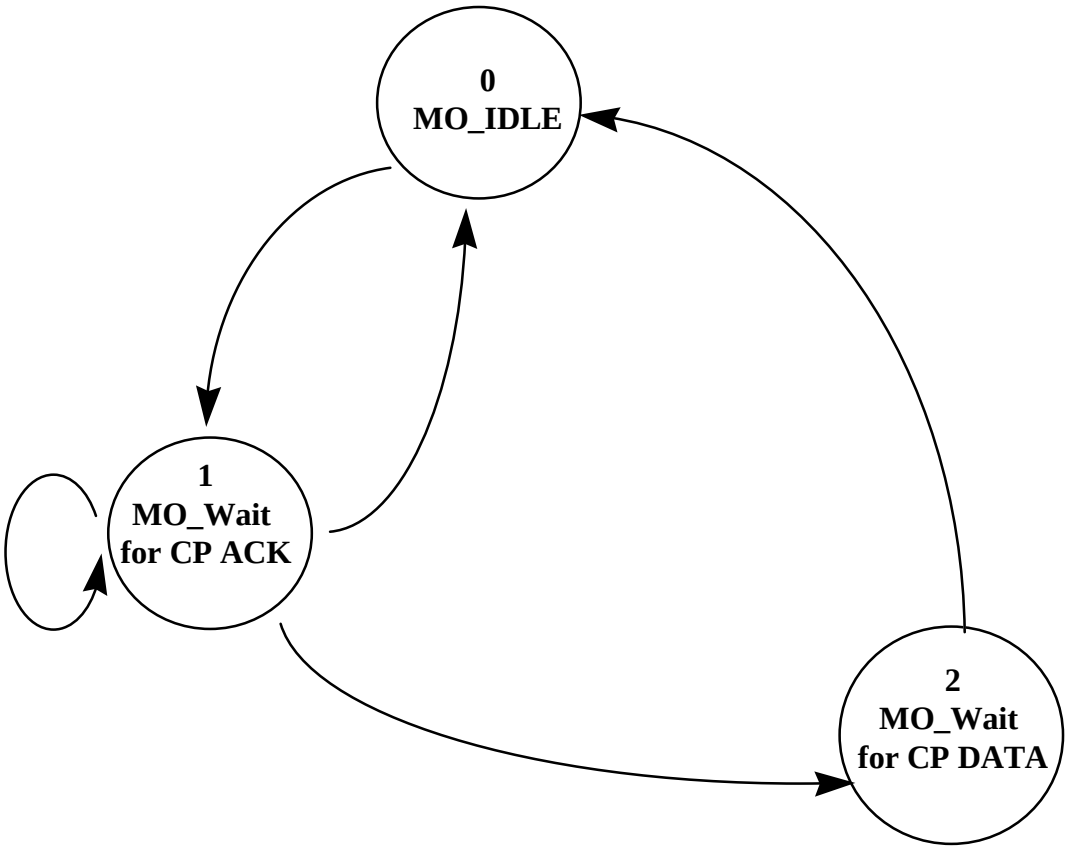
MO-SMC-GP entity on MS-side for GPRS
SDL-13



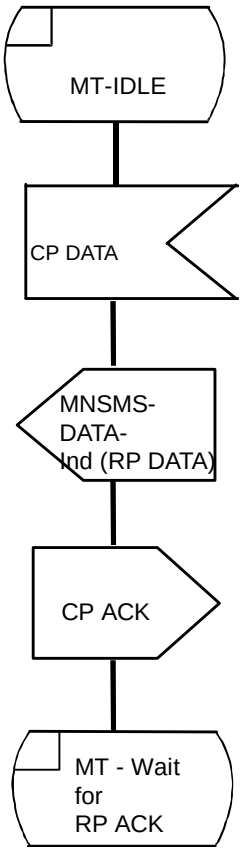
MO-SMC-GP entity on MS-side for GPRS
SDL-14



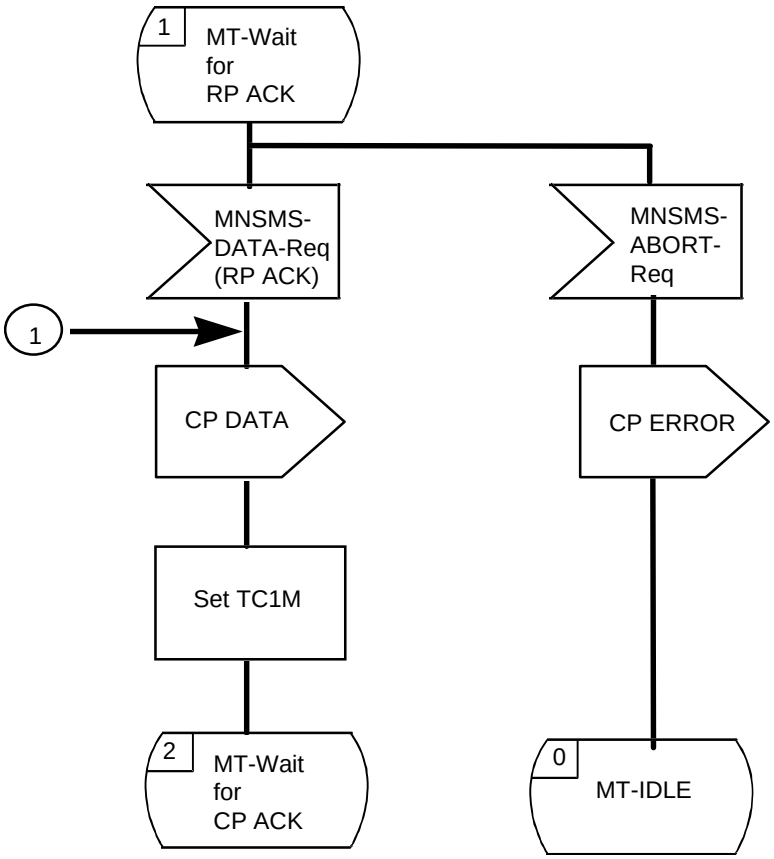
MO-SMC-GP entity on MS-side for GPRS
SDL-15



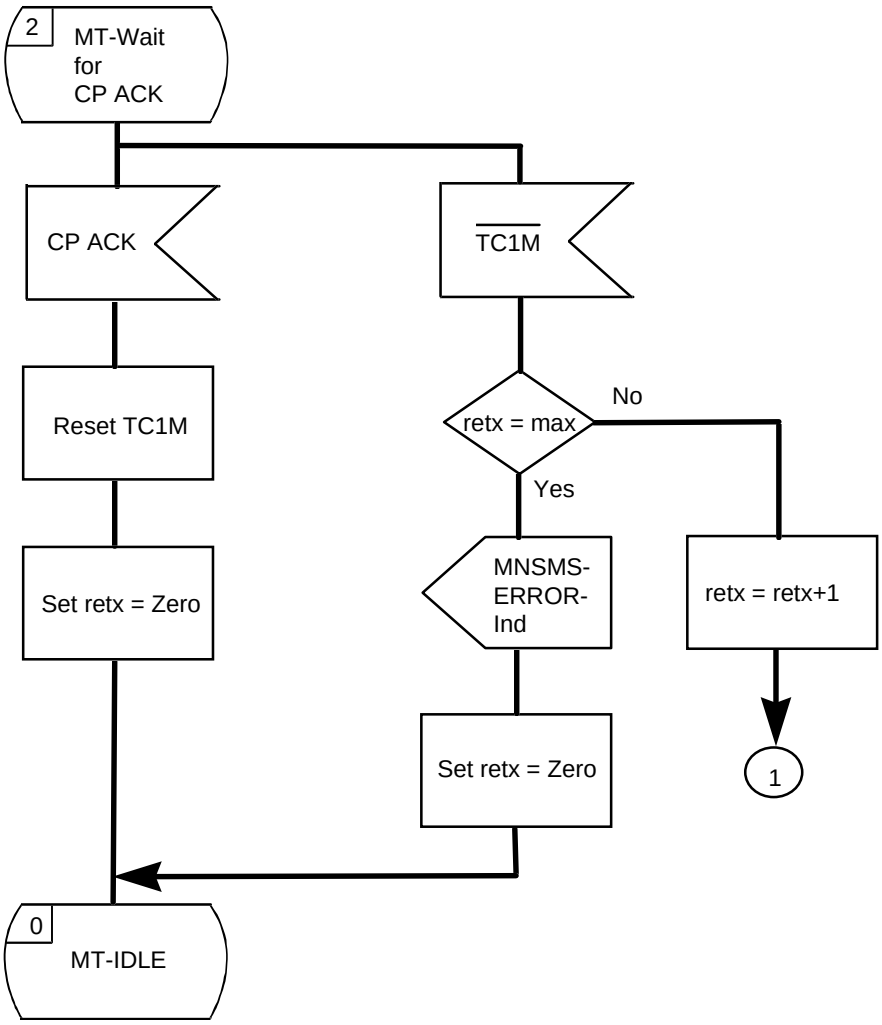
MO-SMC-GP entity on MS-side for GPRS
State transition diagram



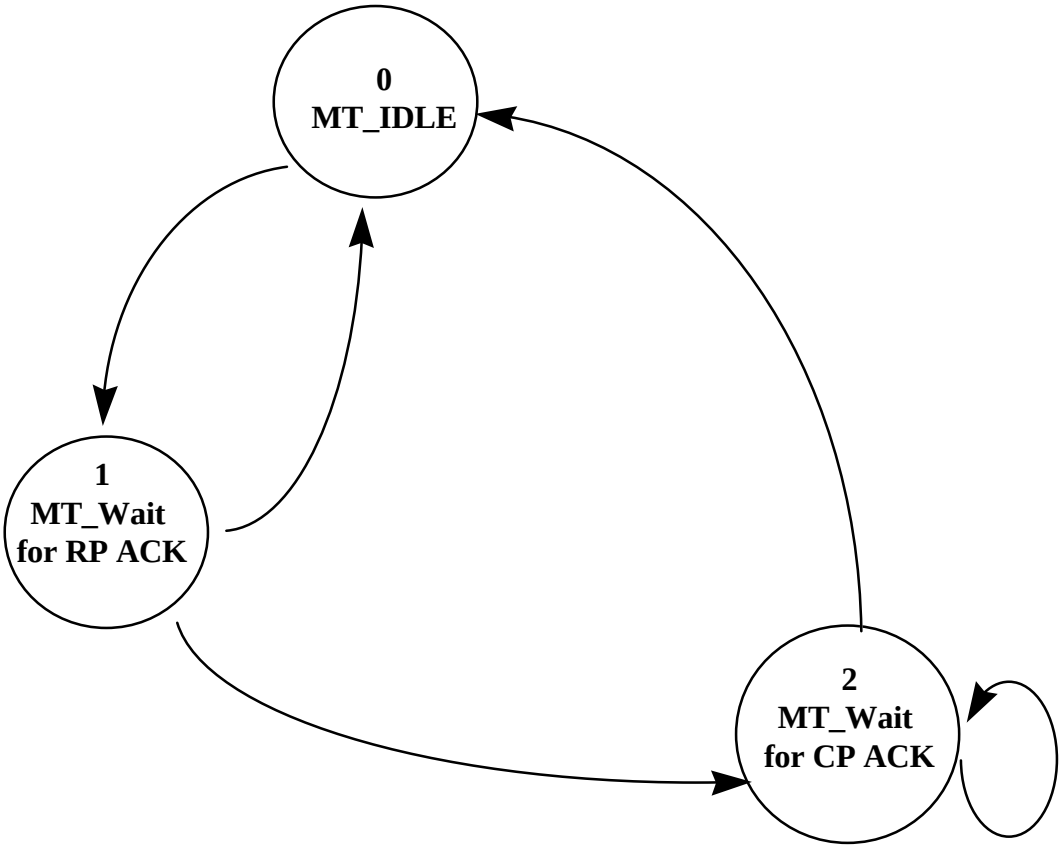
MT-SMC-GP entity on MS-side for GPRS
SDL-16



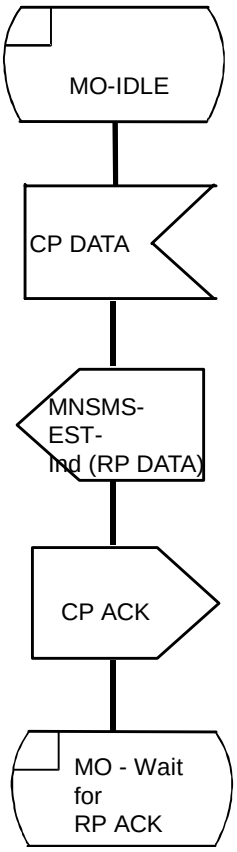
MT-SMC-GP entity on MS-side for GPRS
SDL-17



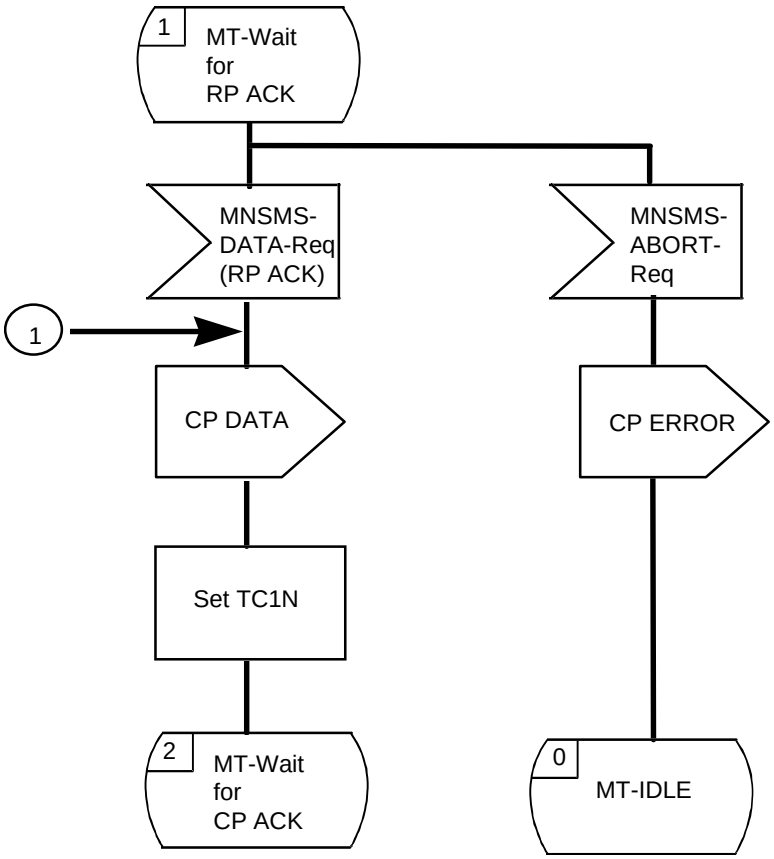
MT-SMC-GP entity on MS-side for GPRS
SDL-18



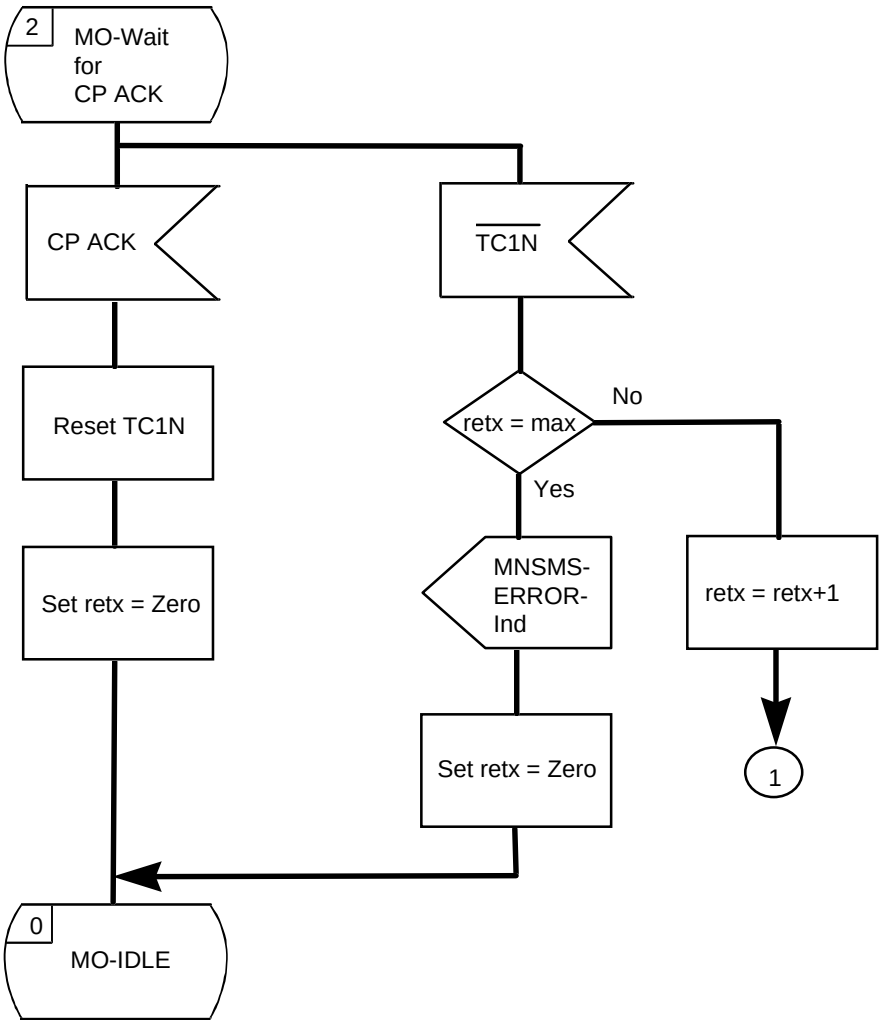
MT-SMC-GP entity on MS-side for GPRS
State transition diagram



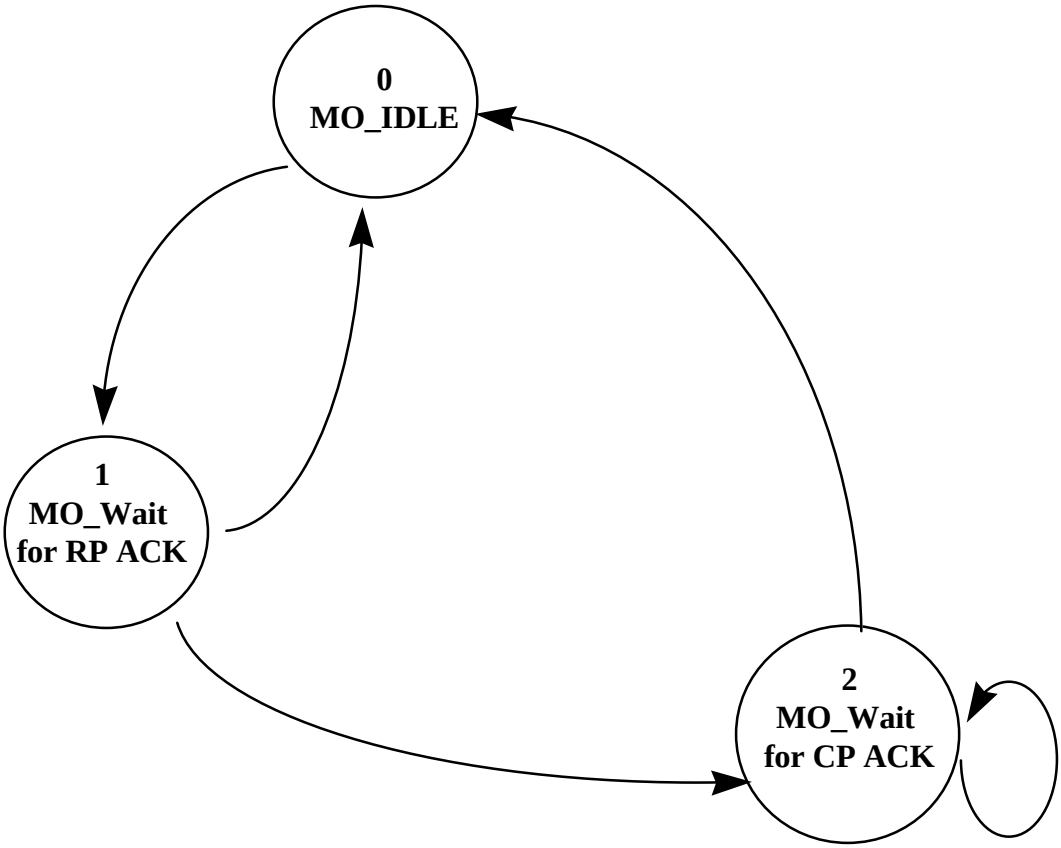
MO-SMC-GP entity on Network side for GPRS
SDL-19



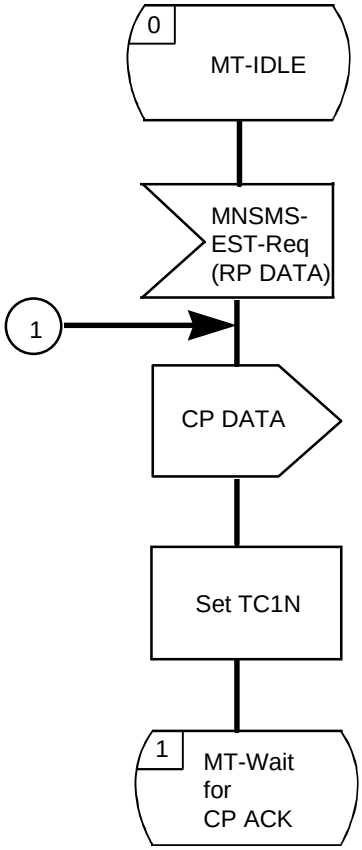
MO-SMC-GP entity on Network side for GPRS
SDL-20



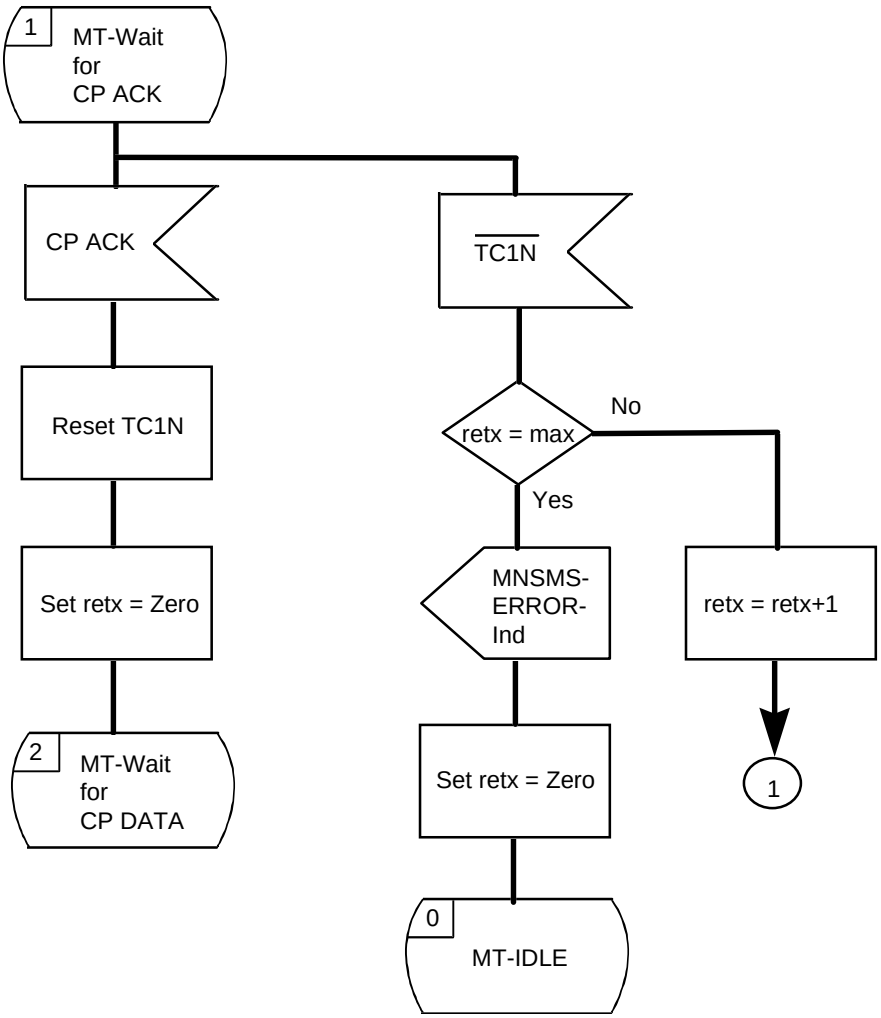
MO-SMC-GP entity on Network side for GPRS
SDL-21



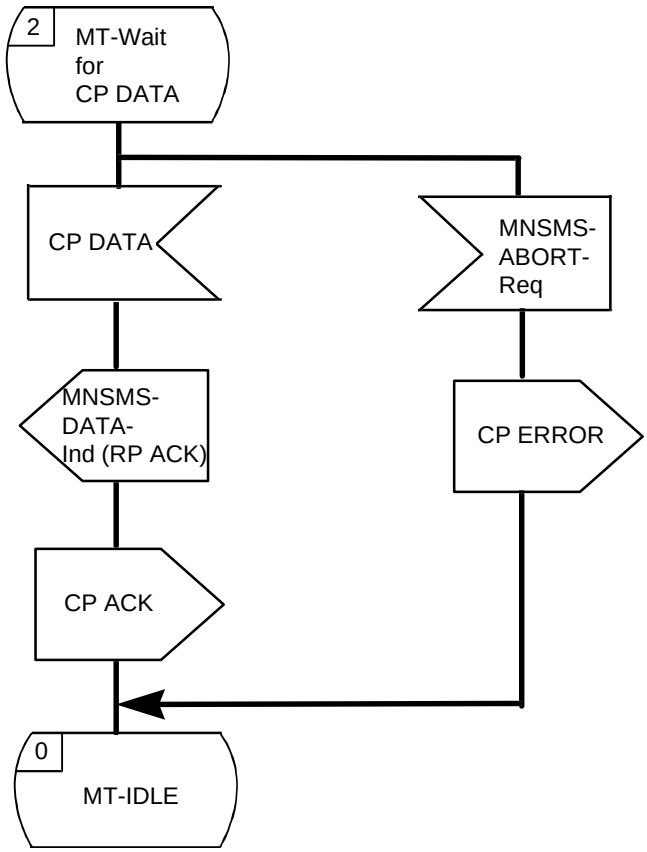
MO-SMC-GP entity on Network-side for GPRS
State transition diagram



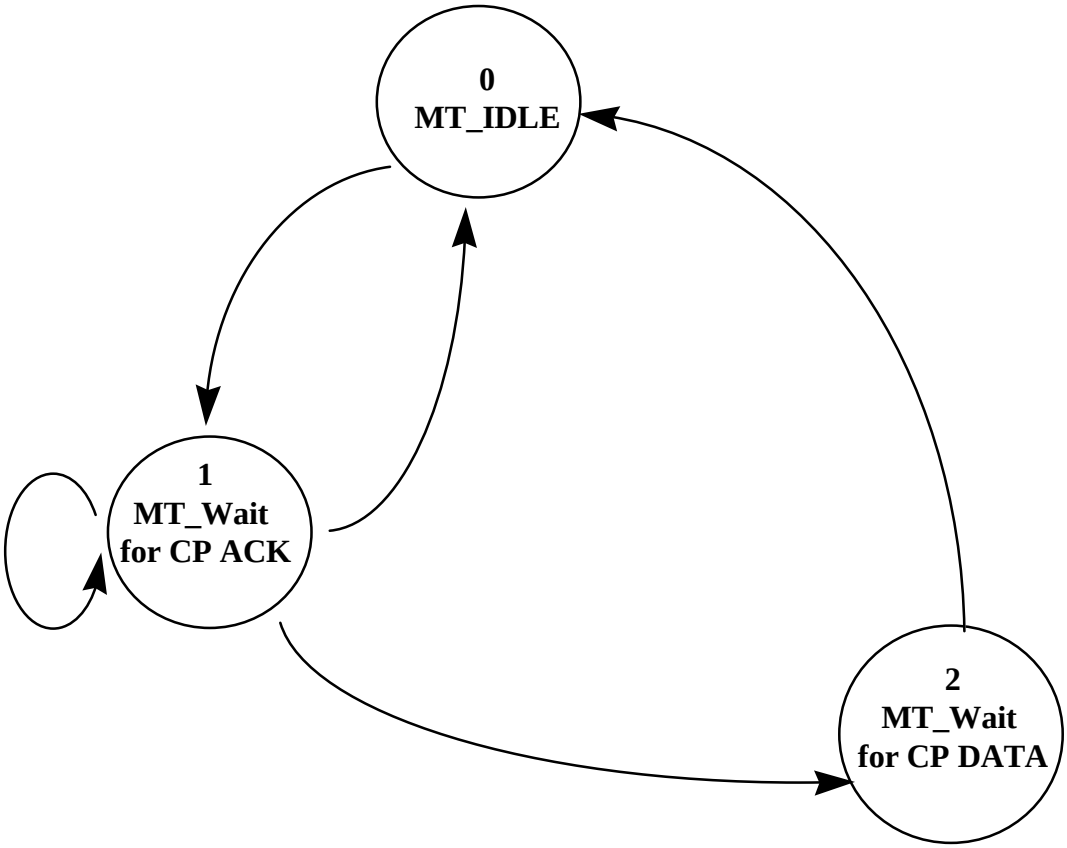
MT-SMC-GP entity on Network-side for GPRS
SDL-22



MT-SMC-GP entity on Network-side for GPRS
SDL-23



MT-SMC-GP entity on Network-side for GPRS
SDL-24



MT-SMC-GP entity on Network-side for GPRS
State transition diagram

3GPP/SMG Meeting #11
Umea, Sweden, 28 February - 03 March.2000

***Document* N1-000546**
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

23.122	CR	04r1	Current Version:	3.1.1

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	TSGN #7	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic	X	

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)*	(U)SIM		ME	X	UTRAN / Radio	X	Core Network	X

Source: CN1 **Date:** 17.2.2000

Subject: UMTS references in 23.122

Work item: TEI

Category: *(only one category shall be marked with an X)*

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature			Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification	X		Release 99	X
				Release 00	

Reason for change: 23.122 was created as a spin-off of GSM 03.22 and consequently all references are dealing with the GSM world only. This CR introduces the appropriate references to UMTS specifications.

Clauses affected: The whole document

Other specs affected:

Other 3G core specifications		→ List of CRs:
Other GSM core specifications		→ List of CRs:
MS test specifications		→ List of CRs:
BSS test specifications		→ List of CRs:
O&M specifications		→ List of CRs:

Other comments: This CR is part of the CN specification cleanup for R99.

help.doc

<--------- double-click here for help and instructions on how to create a CR.

3GPP/SMG Meeting TSG-CN-WG1 #11
Umeå, Sweden, 28 Feb - 3 March 2000

Document ***N1-000456***

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

24.008	**CR**	**181**	Current Version:	3.2.1

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to: TSG CN#7 *list expected approval meeting # here ↑*

for approval [ ] for information [X]

strategic [ ] non-strategic [ ] *(for SMG use only)*

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)* (U)SIM [ ] ME [X] UTRAN / Radio [ ] Core Network [X]

Source: CN1 **Date:** 1.03.00

Subject: Removal of X.25 for packet domain services

Work item: TEI

Category: *(only one category shall be marked with an X)*

F	Correction	[ ]
A	Corresponds to a correction in an earlier release	[ ]
B	Addition of feature	[ ]
C	Functional modification of feature	[X]
D	Editorial modification	[ ]

Release:

Phase 2	[ ]
Release 96	[ ]
Release 97	[ ]
Release 98	[ ]
Release 99	[X]
Release 00	[ ]

Reason for change:

The CR removes the possibility for X.25 related communication within the GPRS and UMTS packet domains. This is in accordance with a 3GPP decision for release 99. No backward compatibility issues are identified. (ie. a R99 MS and network will not request X.25 communication and a R99 network will reject X.25 requests from a pre-R99 MS supporting this feature)

Clauses affected: 10.5.6.4

Other specs affected:

Other 3G core specifications	[ ]	→ List of CRs:
Other GSM core specifications	[ ]	→ List of CRs:
MS test specifications	[ ]	→ List of CRs:
BSS test specifications	[ ]	→ List of CRs:
O&M specifications	[ ]	→ List of CRs:

Other comments:

10.5.6.4 Packet data protocol address

The purpose of the *packet data protocol address* information element is to identify an address associated with a PDP.

The *packet data protocol address* is a type 4 information element with minimum length of 4 octets and a maximum length of 20 octets.

The *packet data protocol address* information element is coded as shown in figure 10.5.137/TS 24.008 and table 10.5.155/TS 24.008.

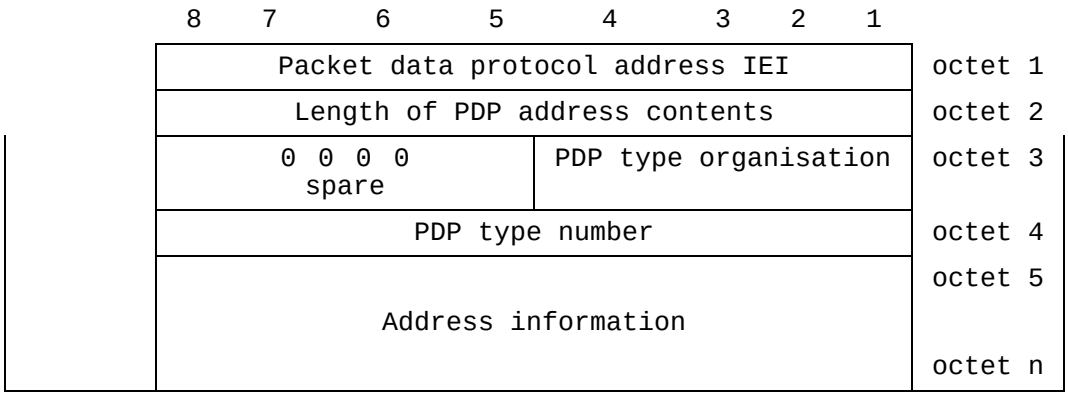


Figure 10.5.137/TS 24.008: *Packet data protocol address* information element

Table 10.5.155/TS 24.008: *Packet data protocol address* information element

Length of PDP address contents (octet 2)

If the value of octet 2 equals 0000 0010, then :

- No PDP address is included in this information element; and

- If the PDP type is IP, dynamic addressing is applicable.

NOTE : For PPP and OSP:IHOSS, no address is required in this information element.

PDP type organisation (octet 3)
Bits
4 3 2 1
In MS to network direction :
0 0 0 0 ETSI allocated address ~~(e.g. X.121)~~
0 0 0 1 IETF allocated address
1 1 1 1 Empty PDP type

All other values are reserved.

In network to MS direction :
0 0 0 0 ETSI allocated address ~~(e.g. X.121)~~
0 0 0 1 IETF allocated address

All other values are reserved.

If bits 4,3,2,1 of octet 3 are coded 0 0 0 0
PDP type number value (octet 4)
Bits
8 7 6 5 4 3 2 1
0 0 0 0 0 0 0 0 ~~X.121 address~~Reserved, used in earlier version of this protocol
0 0 0 0 0 0 0 1 PDP-type PPP
0 0 0 0 0 0 1 0 PDP-type OSP:IHOSS

All other values ~~shall be interpreted as X.121 address in this version of the protocol~~are reserved.

If bits 4,3,2,1 of octet 3 are coded 0 0 0 1
PDP type number value (octet 4)
Bits
8 7 6 5 4 3 2 1
0 0 1 0 0 0 0 1 IPv4 address
0 1 0 1 0 1 1 1 IPv6 address

All other values shall be interpreted as IPv4 address in this version of the protocol.

In MS to network direction:
If bits 4,3,2,1 of octet 3 are coded 1 1 1 1
PDP type number value (octet 4)
bits 8 to 1 are spare and shall be coded all 0.

Octet 3, bits 7, 6, and 5 are spare and shall be coded all 0.

~~If PDP type number indicates X.121, the Address information is coded as follows:~~

~~8~~	~~7~~	~~6~~	~~5~~	~~4~~	~~3~~	~~2~~	~~1~~	
~~digit 2~~				~~digit 1~~				~~octet 5~~
~~digit 4~~				~~digit 3~~				~~octet 6~~
~~digit m+1~~				~~digit m~~				~~octet n*~~

~~Digit 1 contains the first BCD coded digit of the X.121 address. If the X.121 address has an odd number of digits, digit m+1 shall be padded with HEX(F).~~

If PDP type number indicates IPv4, the Address information in octet 5 to octet 8 contains the IPv4 address. Bit 8 of octet 5 represents the most significant bit of the IP address and bit 1 of octet 8 the least significant bit .

If PDP type number indicates IPv6, the Address information in octet 5 to octet 20 contains the IPv6 address. Bit 8 of octet 5 represents the most significant bit of the IP address and bit 1 of octet 20 the least significant bit.

3G TS 23.122 V3.1.1 (2000-2)

Technical Specification

3rd Generation Partnership Project; Technical Specification Group Core Network; NAS Functions related to Mobile Station (MS) in idle mode (3G TS 23.122 version 3.1.1)

Reference
DTS/TSGN-0123022U

Keywords
3GPP, CN

3GPP

Postal address

3GPP support office address
650 Route des Lucioles - Sophia Antipolis
Valbonne - FRANCE
Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Internet
http://www.3gpp.org

Contents

Foreword

This Technical Specification has been produced by the 3GPP.

This TS specifies functions related to Mobile Station (MS) in idle mode and within the 3GPP system.

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of this TS, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version 3.y.z

where:

x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

3 Indicates TSG approved document under change control.

y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z the third digit is incremented when editorial only changes have been incorporated in the specification;

1 Scope

Text to be added.

1.1 Normative 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.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.
- For this Release 1999~~8~~ document, references to GSM and UMTS documents are for Release 1999~~8~~ versions (version 8~~7~~.x.y and 3.x.y).

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

[2] 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)".~~"Digital cellular telecommunications system (Phase 2+); Principles of telecommunications services supported by a GSM Public Land Mobile Network (PLMN)".~~

[3] TS 22.002: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects;Bearer Services (BS) supported by a GSMPublic Land Mobile Network (PLMN)".~~GSM 02.02: "Digital cellular telecommunication system (Phase 2+); Bearer Services (BS) supported by a GSM Public Land Mobile Network (PLMN)".~~

[4] TS 22.003: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects;Circuit Teleservices supported by a Public Land Mobile Network (PLMN)".~~GSM 02.03: "Digital cellular telecommunications system (Phase 2+); Teleservices supported by a GSM Public Land Mobile Network (PLMN)".~~

[5] TS 22.004: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects;General on supplementary services".~~GSM 02.04: "Digital cellular telecommunications system (Phase 2+); General on supplementary services".~~

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

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

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

[9] TS 22.011: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects;Service accessibility".~~GSM 02.11: "Digital cellular telecommunications system (Phase 2+); Service accessibility".~~

[10] TS 22.016: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects;International Mobile station Equipment Identities (IMEI)".~~GSM 02.16: "Digital cellular telecommunications system (Phase 2+); International Mobile station Equipment Identities (IMEI)".~~

[11] TS~~GSM~~ 02.17: "Digital cellular telecommunications system (Phase 2+); Subscriber identity modules Functional characteristics".

[12] TS 22.024: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects;Description of Charge Advice Information (CAI)".~~GSM 02.24: "Digital cellular telecommunications system (Phase 2+); Description of Charge Advice Information (CAI)".~~

[13] TS 22.030: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects;Man-Machine Interface (MMI) of the User Equipment (UE)"~~GSM 02.30: "Digital cellular telecommunications system (Phase 2+); Man-Machine Interface (MMI) of the Mobile Station (MS)".~~

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

[15] TS 22.041: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects;Operator Determined Barring (ODB)".~~GSM 02.41: "Digital cellular telecommunications system (Phase 2+); Operator determined barring".~~

[16] TS 22.081: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects;Line identification Supplementary Services;Stage 1".~~GSM 02.81: "Digital cellular telecommunications system (Phase 2+); Line identification supplementary services - Stage 1".~~

[17] TS 22.082: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects;Call Forwarding (CF) supplementary services - Stage 1".~~GSM 02.82: "Digital cellular telecommunications system (Phase 2+); Call Forwarding (CF) supplementary services - Stage 1".~~

[18] 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".~~GSM 02.83: "Digital cellular telecommunications system (Phase 2+); Call Waiting (CW) and Call Hold (HOLD) supplementary services - Stage 1".~~

[19] TS 22.084: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects;MultiParty (MPTY) Supplementary Services - Stage 1".~~GSM 02.84: "Digital cellular telecommunications system (Phase 2+); MultiParty (MPTY) supplementary services - Stage 1".~~

[20] TS 22.085: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects;Closed User Group (CUG) Supplementary Services - Stage 1".~~GSM 02.85: "Digital cellular telecommunications system (Phase 2+); Closed User Group (CUG) supplementary services - Stage 1".~~

[21] TS 22.086: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects;Advice of Charge (AoC) Supplementary Services - Stage 1".~~GSM 02.86: "Digital cellular telecommunications system (Phase 2+); Advice of Charge (AoC) supplementary services - Stage 1".~~

[22] TS 22.088: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects;Call Barring (CB) Supplementary Services - Stage 1".~~GSM 02.88: "Digital cellular telecommunications system (Phase 2+); Call Barring (CB) supplementary services - Stage 1".~~

[23] TS 24.008: "3rd Generation Partnership Project;Universal Mobile Telecommunications System;Mobile radio interface layer 3 specification, Core Network Protocols - Stage 3".~~GSM 04.08: "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 specification".~~

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

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

[26] TS 22.060: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects;General Packet Radio Service (GPRS);Service description, Stage 1".GSM 02.60: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Service description Stage 1".

[27] TS 23.060: "3rd Generation Partnership Project;Technical Specification Group Services and System Aspects;General Packet Radio Service (GPRS);Service description;Stage 2".GSM 03.60: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Service description Stage 2".

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

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

[30] TSGSM 03.56: "Digital cellular telecommunications system (Phase 2+); GSM Cordless Telephony System (CTS); CTS Architecture Description; Stage 2

[31] TS 25.101: "3rd Generation Partnership Project (3GPP) Technical Specification Group (TSG) RAN WG4 UE Radio transmission and Reception (FDD)".

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

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

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

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

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

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

1.2 Definitions and abbreviations

Abbreviations used in this TS are listed in TSGSM 01.04 and 21.905.

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.

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

Available PLMN This is a PLMN where the MS has found a cell that satisfies conditions (ii) and (iv) of subclause 3.2.1 in TS 03.22. For UMTS the criteria is specified in TS 25.304.

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

Allowable PLMN This is a PLMN which is not in the list of forbidden PLMNs in the MS.

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.

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

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.

Suitable Cell This is a cell on which an MS may camp. It must satisfy criteria~~-~~ which is defined for GSM in TS 03.22 ~~subclause 3.2.1~~ and for UMTS in TS 25.304.~~.~~

Acceptable Cell This is a cell that the MS may camp on to make emergency calls. It must satisfy criteria which is defined for GSM in TS 03.22 and for UMTS in TS 25.304.~~defined in TS 03.22 sub clause 3.2.2.~~

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

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

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 TS 23.060~~GSM 03.60~~).

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.

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.

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

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).

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.

(GSM only) Indicates this section or paragraph applies only to GSM system. For multi system case this is determined by the current serving radio access network.

(UMTS only) Indicates this section or 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 TS~~-GSM~~ 02.17). This specification makes no distinction between SIM and USIM.

MS Mobile Station. This specification makes no distinction between MS and UE.

2 General description of idle mode

When an MS is switched on, it attempts to make contact with a GSM 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, it reselects onto the most suitable alternative 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 which need no registration for example GPRS services PTM-M or PTP anonymous access.

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

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 TS 03.22 subclauses 3.5.3 and 3.5.4 and 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.

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.

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.

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. The states and state transitions within each process are shown in figures 2 to 4.

3 Requirements and technical solutions

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

3.1 PLMN selection and roaming

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

i) Automatic mode - This mode utilizes a list of PLMNs in priority order. The highest priority PLMN which is available and allowable is selected.

ii) Manual mode - Here the MS indicates to the user which PLMNs are available. Only when the user makes a manual selection does the MS try to obtain normal service on the VPLMN.

There are two cases:

- International Roaming - This is where the MS receives service on a PLMN of a different country than that of the HPLMN.

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

To prevent repeated attempts to have roaming service on a not allowed LA, when the MS is informed that an LA is forbidden, the LA is added to a list of "forbidden LAs for roaming" which is stored in the MS. This list is deleted when the MS is switched off or when the SIM is removed. Such area restrictions are always valid for complete location areas independent of possible subdivision into GPRS routing areas. The structure of the routing area identifier (TS 23.003~~GSM 03.03~~) supports area restriction on LA basis.

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

A ME not supporting SoLSA may consider a cell with the escape PLMN code (see TS 23.073~~GSM 03.73~~) to be a part of a PLMN belonging to the list of "forbidden PLMNs".

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

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 LAIs 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. If the MS cannot find a suitable cell, the MS performs the PLMN selection procedure starting at subclause 4.4.3.1 A or B

In GSM, a cell may be reserved for SoLSA exclusive access (see TS 24.008~~GSM 04.08~~ and 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 camp for limited service.

NOTE: In GSM, in a SoLSA exclusive cell the MCC+MNC code is replaced by an unique escape PLMN code (see ~~GSM 03.73~~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 LA 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 LA.

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 subclause 4.4.3.1 and when indicated in the SIM also as described in subclause 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.

3.6 CTS fixed part selection (GSM 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 ~~GSM~~ TS 05.08 subclause 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.

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

In the event of any conflict between the diagrams and the text in this ETS, 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 4)

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

4.3.3 List of states for location registration (figure 4)

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

L1 Updated - The MS enters this state if an LR request is accepted. The update status is set to "updated". The GPRS and the non-GPRS update state of a MS may enter "updated“ as a result of combined signalling or as a result of individual signalling depending on the capabilities of the network.

L2 Idle, No IMSI - The MS enters this state if an LR request is rejected with cause:

a) IMSI unknown in HLR;

b) illegal ME;

c) illegal MS;

d) GPRS 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) results in "Roaming not allowed“ for the non-GPRS update state only. Event a) has no influence on the GPRS update state. Event d) results in "Roaming not allowed“ for the GPRS update state only. Event d) has no influence on the non-GPRS update state.

If a SIM is present, the non-GPRS update status of the SIM is set to "Roaming not allowed" for events a), b) and c).

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.

All update states of the MS are set to "Roaming not allowed" regardless whether received by individual or combined signalling. The behaviour of the MS in the roaming not allowed state is dependent on the LR reject cause as shown in table 2. Additionally:

- in automatic mode, "PLMN not allowed" and "roaming not allowed in this location area" cause the Automatic Network Selection procedure of subclause 4.4.3.1A to be started; it is also caused by "GPRS not allowed“ when received by a MS capable of GPRS only;

- in manual mode, "PLMN not allowed" and "roaming not allowed" cause the Manual Network Selection procedure of subclause 4.4.3.1B to be started; it is also caused by "GPRS not allowed“ when received by MS capable of GPRS only.

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.

4.4 PLMN selection process

4.4.1 Introduction

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

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.

4.4.3.1 At switch-on or recovery from lack of coverage

At switch on, the MS selects and attempts to perform a Location Registration on the registered PLMN, if it exists. On recovery from lack of coverage, the MS selects the registered PLMN (if it exists) and, if necessary (see subclause 4.5.2) attempts to perform a Location Registration.

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.

A) Automatic Network Selection Mode Procedure

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

i) HPLMN (if not previously selected);

ii) each PLMN in the "PLMN Selector" data field in the SIM (in priority order);

iii) other PLMNs with received high quality signal in random order;

iv) all other PLMNs in order of decreasing signal quality.When following the above procedure the following requirements apply:

a) An MS with GSM voice capability shall ignore PLMNs for which the MS has identified at least one cell that transmits CELL_BAR_QUALIFY_2.

b) An MS with GSM voice capability shall not search for CPBCCH carriers.

c) In step i and ii, the MS should limit its search of network types to the one associated with the PLMN which it is attempting to select and register to (HPLMN or any PLMN on the PLMN selector). If a PLMN entry on the PLMN selector specifies more than one network type, the MS may scan for network types in the order of the time it takes to identify them (with the exception of requirement b), starting with the network type that takes the shortest time to identify.

d) In step iii and iv, the MS shall search for all network types it is capable of, with the exception of requirement b), before deciding which PLMN to select.

e) A MS that does not have any stored network type information on the SIM shall first go through the steps by only searching for the BCCH network type. If no successful registration is achieved, then the COMPACT capable MS without GSM voice shall redo the procedure assuming that all PLMNs may be supporting all network types.

NOTE: Requirements a) and b) do not apply to MSs supporting GSM circuit-switched data without supporting GSM voice.

NOTE: 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 a forbidden LAI list prevented a registration attempt, the MS selects the first such PLMN again and enters a limited service state.

B) Manual Network Selection Mode Procedure

The MS indicates whether there are any PLMNs, in all of its bands of operation, which are available. This includes "Forbidden PLMNs". Any PLMN shall only be presented once.

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

i) HPLMN;

ii) PLMNs contained in the "PLMN Selector" data field in the SIM (in priority order);

iii) other PLMNs with received high quality signal in random order;

iv) all other PLMNs in order of decreasing signal quality.

The user may select his desired PLMN and the MS then initiates registration on this PLMN. (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 LAI and PLMN lists.

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: The scan in manual network selection mode includes PLMNs having cells with CELL_BAR_QUALIFY_2 transmitted and cells with CPBCCHs.

NOTE: 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.

A) 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 "PLMN Selector" data field in the SIM (in priority order) excluding the previously selected PLMN;

iii) Other PLMNs with the received high quality signal in random order excluding the previously selected PLMN;

iv) Any other PLMNs, excluding the previously selected PLMN in order of decreasing signal quality or, alternatively, the previously selected PLMN may be chosen ignoring its signal quality;

v) The previously selected PLMN.

When following the above procedure the following requirements apply:

a) An MS with GSM voice capability shall ignore PLMNs for which the MS has identified at least one cell that transmits CELL_BAR_QUALIFY_2.

b) An MS with GSM voice capability shall not search for CPBCCH carriers.

c) In step i and ii, the MS should limit its search of network types to the one associated with the PLMN which it is attempting to select and register to (HPLMN or any PLMN on the PLMN selector). If a PLMN entry on the PLMN selector specifies more than one network type, the MS may scan for network types in the order of the time it takes to identify them (with the exception of requirement b), starting with the network type that takes the shortest time to identify.

d) In step iii, iv, and v, the MS shall search for all network types it is capable of, with the exception of requirement b), before deciding which PLMN to select.

e) A MS that does not have any stored network type information on the SIM shall first go through the steps by only searching for the BCCH network type. If no successful registration is achieved, then the COMPACT capable MS without GSM voice shall redo the procedure assuming that all PLMNs may be supporting all network types.

NOTE: Requirements a) and b) do not apply to MSs supporting GSM circuit-switched data without supporting GSM voice.The previously selected PLMN is the PLMN which the MS has selected prior to the start of the user reselection procedure

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

B) Manual Network Selection Mode

The Manual Network Selection Mode Procedure of subclause 4.4.3.1 is followed.

4.4.3.3 In VPLMN of home country

The MS shall periodically attempt to obtain service on its HPLMN by scanning in accordance with the requirements that are applicable to step i) as defined in the Automatic Network Selection Mode. 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 30 minutes is used.

The attempts to access the HPLMN shall be as specified below:

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

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 is not found, the MS shall remain on the VPLMN.

4.4.3.4 Investigation Scan for higher prioritized PLMN

A MS capable of both voice and packet service shall, when indicated in the SIM, investigate if there is service from a higher prioritized PLMN not offering voice service, either HPLMN or a PLMN in the "PLMN Selector" data field in the SIM. The scan shall be performed in accordance with the requirements described for automatic network selection mode in subclause 4.4.3.1 that are applicable to step i) and step ii) with the exception of requirement a) and b) in subclause 4.4.3.1. Requirement a) and b) that are specified for automatic network selection mode in subclause 4.4.3.1 shall be ignored during the investigation scan.

The investigation scan for higher prioritized PLMN shall be as specified below:

a) The scan shall only be performed in automatic network selection mode;

b) The scan shall only be performed by an MS that is capable of both voice and packet;

c) The scan shall only be performed if the serving PLMN is not the highest prioritized PLMN in the current country (HPLMN in home country, otherwise according to the PLMN selector list);

d) The scan shall be performed at least once after a successful PLMN selection is completed;

e) The investigation scan should be performed when the MS enters idle mode;

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

Note: The MS remains on the RPLMN independent of the outcome of the investigation scan. The purpose of the investigation scan is to check if there is a higher prioritized PLMN, not to select it.

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 A.

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 subclause 4.4.3.1 are followed, depending on whether the MS is in automatic or manual mode. (This requirement applies to all MSs.)

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 subclause 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 a list of forbidden LAIs or PLMN identities 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.

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. Depending on system information about GPRS network operation mode MSs capable of GPRS and non-GPRS services 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 or falls back to a GPRS only MS.

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 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 LAIs.

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 paragraph 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 subclause 4.5.2 shall be performed.

4.6 Service indication

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 TS~~GSM~~ 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 ~~GSM 02.11~~TS 22.011, then it shall listen to all paging messages that could address it.

NOTE 1: In GSM, 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.

5 Tables and Figures

Table 1: Effect of LR Outcomes on PLMN Registration

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

1) The MS will eventually either enter a different state when the registration status will be determined, or fail to be able to camp on a cell, when registration will be unsuccessful.

2) The MS will select the HPLMN if in automatic mode and will enter Automatic Network Selection Mode Procedure of subclause 4.4.3.1. If in manual mode, the MS will display the list of available PLMNs and follow the Manual Network Selection Mode Procedure of subclause 4.4.3.1. If the appropriate process does not result in registration, the MS will eventually enter the limited service state.

3) A MS may have different update states for GPRS and non-GPRS. A PLMN is registered when at least one of both update states is updated.

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

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

Table 2: LR Process States and Allowed Actions

Location registration task state	New LR request when				Normal Calls Supported (1)	Paging responded to
	Changing Cell	Changing registration area	Changing PLMN	Other		
Null (4)	No	Yes	Yes	No	No	No
Updated, (5)	No	Yes	Yes	(2)	Yes	Yes
Idle, No IMSI (7)	No	No	No	No	No	No
Roaming not allowed:						
a) Idle, PLMN not allowed	No	No	Yes	No	No	Optional if with IMSI
b) Idle, LA not allowed	No	Yes(6)	Yes	No	No	Optional if with IMSI
c) Idle, Roaming not allowed in this LA	No	Yes(6)	Yes	No	No	Optional if with IMSI
Not updated	Yes	Yes	Yes	(2)&(3)	(3)	Yes if with IMSI

1): Emergency calls may always be made, subject to access control permitting it.

2): A new LR is made when the periodic registration timer expires.

3): If a normal call request is made, an LR request is made. If successful the updated state is entered and the call may be made.

4): The MS is in the null state from switch on until it has camped on a cell and either made an LR attempt or decided that no LR attempt is needed.

5): In this state, IMSI detach is performed if the MS is deactivated and the BCCH indicates that IMSI attach/detach shall be used. An LR request indicating IMSI attach is performed if the MS is activated in the same registration area in which it was deactivated while being in this state.

6): A GPRS MS shall not perform a new LR when the new routing area is part of a LA contained in a list of forbidden LA.

7): The GPRS registration status "Idle, no IMSI“ is entered when LR is rejected with cause "GPRS not allowed“. The non-GPRS registration status „Idle, no IMSI“ is entered when the cause "IMSI unknown in HLR“ is received.

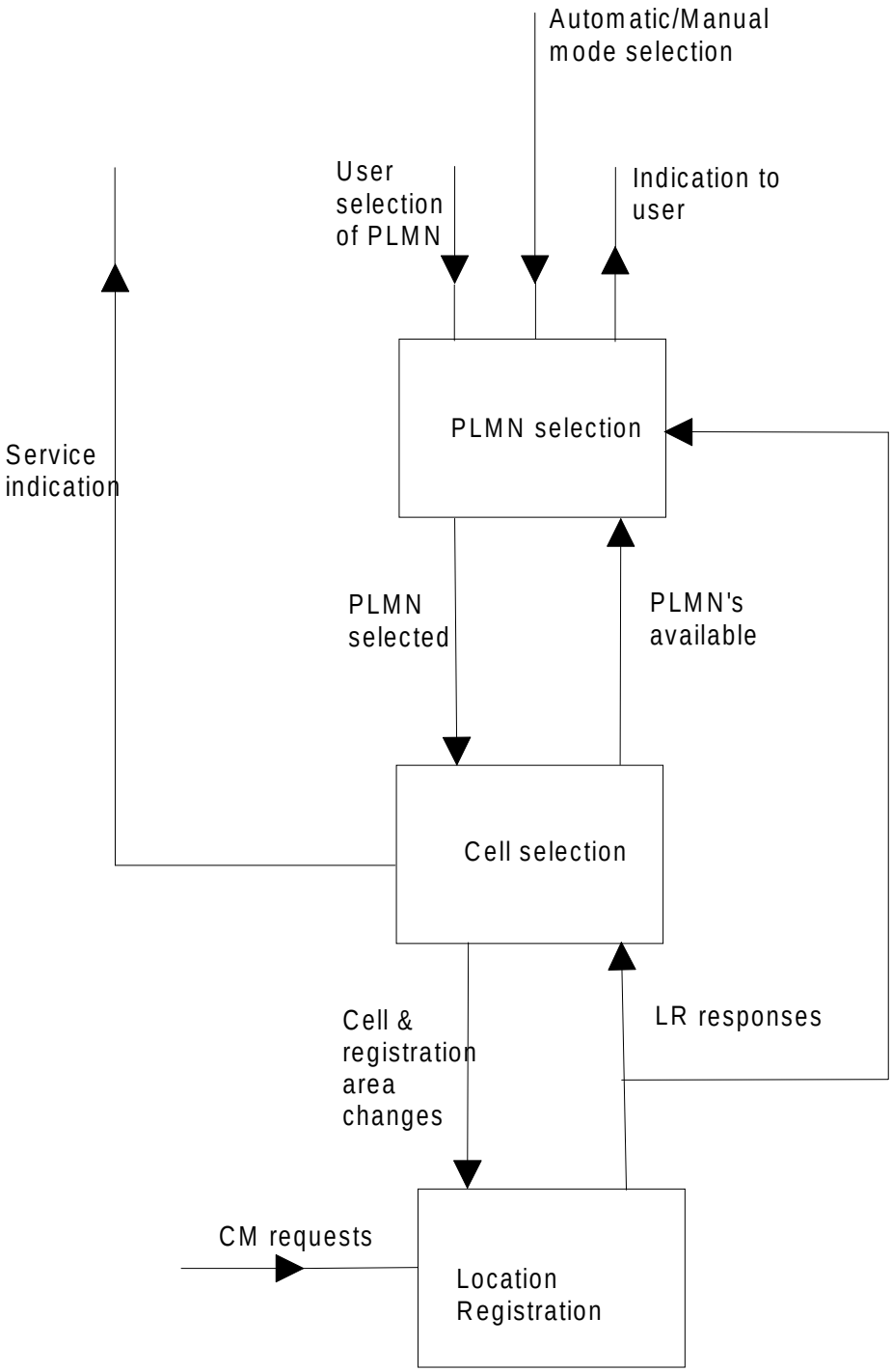
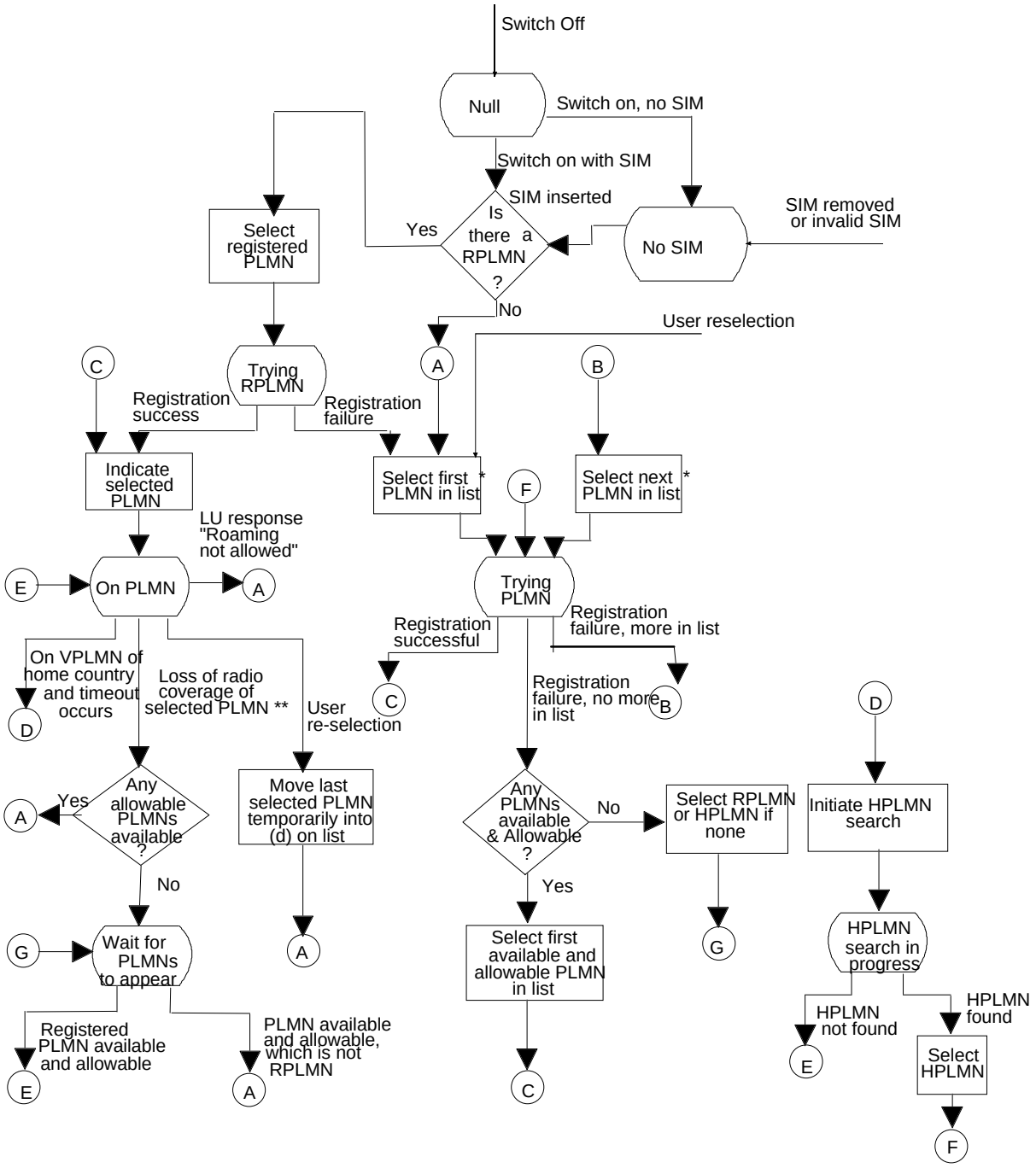


Figure 1: Overall Idle Mode process



* "List" consists of (in order)

a) HPLMN
b) Each PLMN in SIM list in priority order
c) All other PLMNs above -85 dBm in random order
d) Other PLMNs in decreasing order of signal strength

) Provided they are "available" and "allowable"

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

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

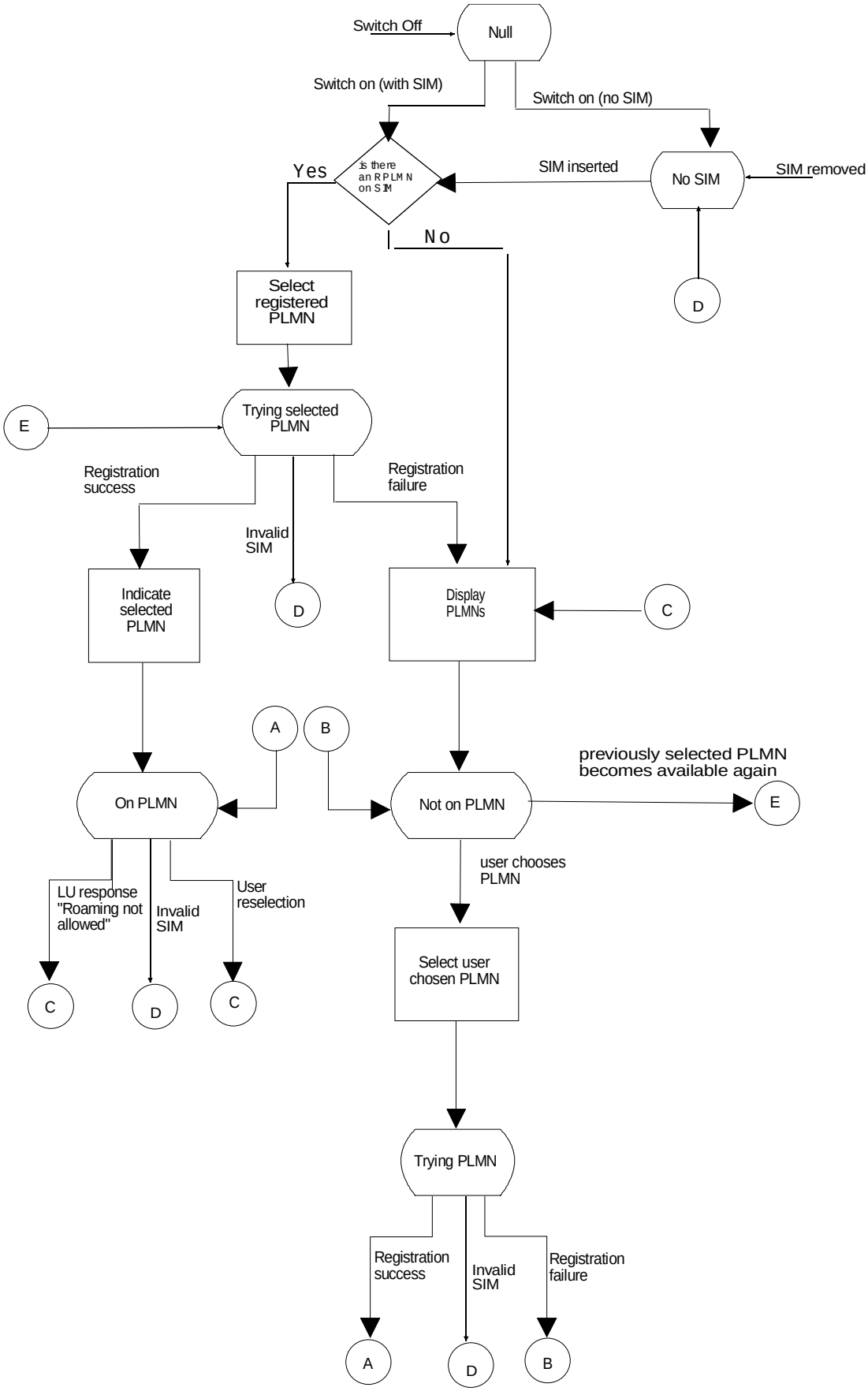


Figure 2b: PLMN Selection State diagram (manual mode)

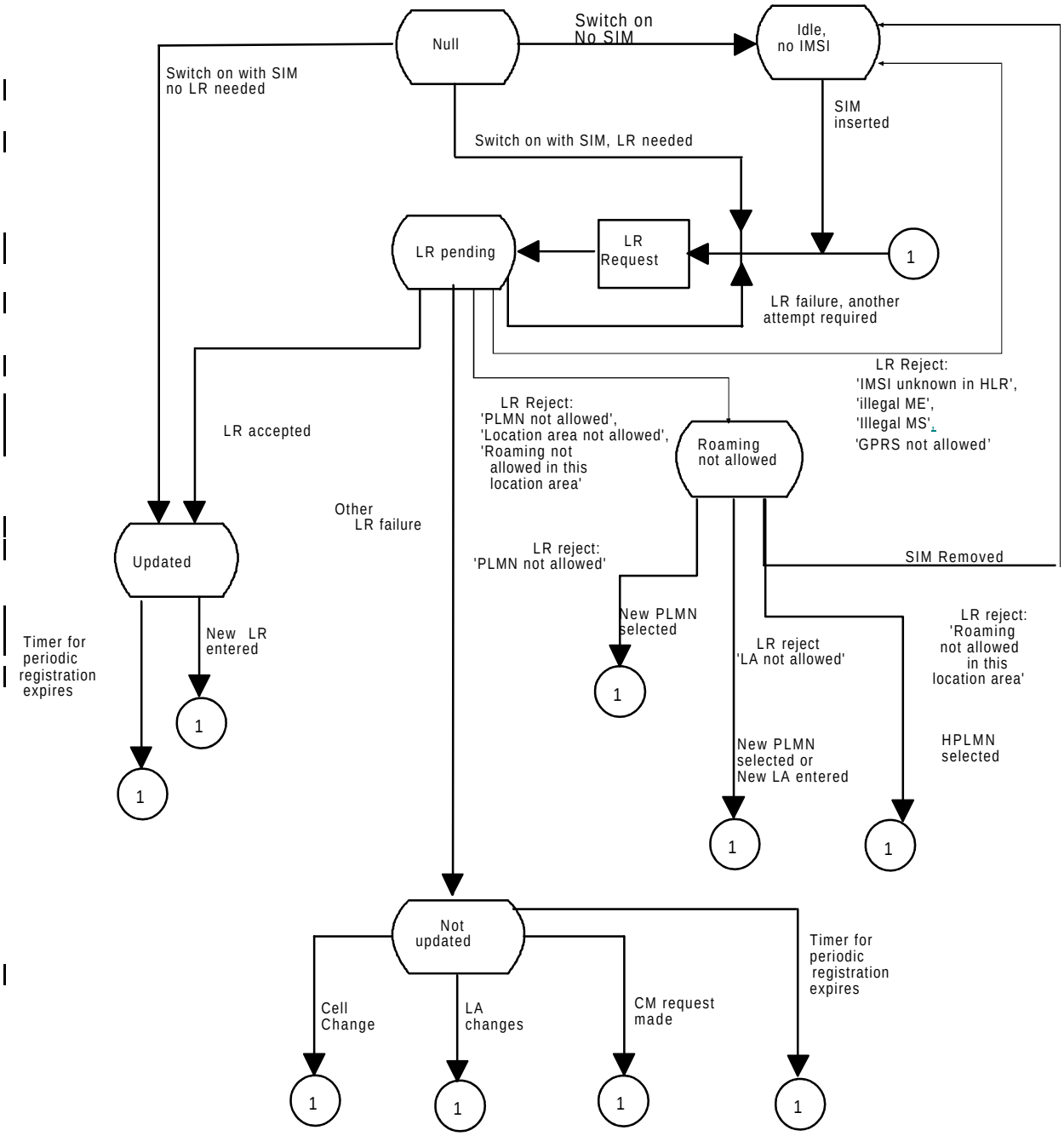


Figure 4: Location Registration Task State diagram

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

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

Annex A (normative): HPLMN Matching Criteria

With the introduction of PCS1900 with the regulatory mandate to allocate 3-digit MNC codes, additional functionality is required to identify the HPLMN.

Assumptions

An MNC code shall consist of 2 or 3 decimal digits. In NA PCS1900, all SIMs shall store 3 digit MNCs.

Any network using a 2 digit MNC code shall broadcast the hexadecimal code "F" in place of the 3rd digit.

For PCS1900 for North America, regulations mandate that a 3-digit MNC shall be used; however during a transition period, a 2 digit MNC may be broadcast by the Network and, in this case, the 3rd digit of the SIM is stored as 0 (this is the 0 suffix rule).

With the exception of North America during the transition period:

a) Within a single country (or area identified by a MCC) all networks shall broadcast a 2 digit MNC code, or all networks shall broadcast a 3 digit MNC code. A mixture of broadcast 2 and 3 digit MNC codes is not permitted within a single country (or area identified by a MCC).

b) A network which broadcasts a 2 digit MNC code, will issue SIMs with a 2 digit MNC code in the IMSI on the SIM. A network which broadcasts a 3 digit MNC code, will issue SIMs with a 3 digit MNC code in the IMSI on the SIM.

Definitions and abbreviations

BCCH-MCC The MCC part of the LAI read from System Information type 3 messages broadcast on the BCCH by the network.

BCCH-MNC The MNC part of the LAI read from System Information type 3 messages broadcast on the BCCH by the network.

SIM-MCC The MCC part of the IMSI read from the SIM.

SIM-MNC The MNC part of the IMSI read from the SIM.

HPLMN Matching Criteria in mobiles which don't support PCS1900 for NA:

Figure A.1 illustrates the logic flow described below. The text below is normative. The Figure A.1 is informative.

(1) The MS shall compare using all 3 digits of the SIM-MCC with the BCCH-MCC. If the values do not match, then the HPLMN match fails.

NOTE: If the MCC codes match, then the number of digits used for the SIM-MNC must be the same as the number of digits used for the BCCH-MNC.

(2) The MS shall read the 3rd digit of the BCCH-MNC. If the 3rd digit is Hex F, then proceed to step (4).

(3) The MS shall compare using all 3 digits of the SIM-MNC with the BCCH-MNC. If the values match, then the HPLMN match succeeds, otherwise the HPLMN match fails.

(4) The MS shall compare using just the 1st 2 digits the SIM-MNC with the BCCH-MNC. If the values match, then the HPLMN match succeeds, otherwise the HPLMN match fails.

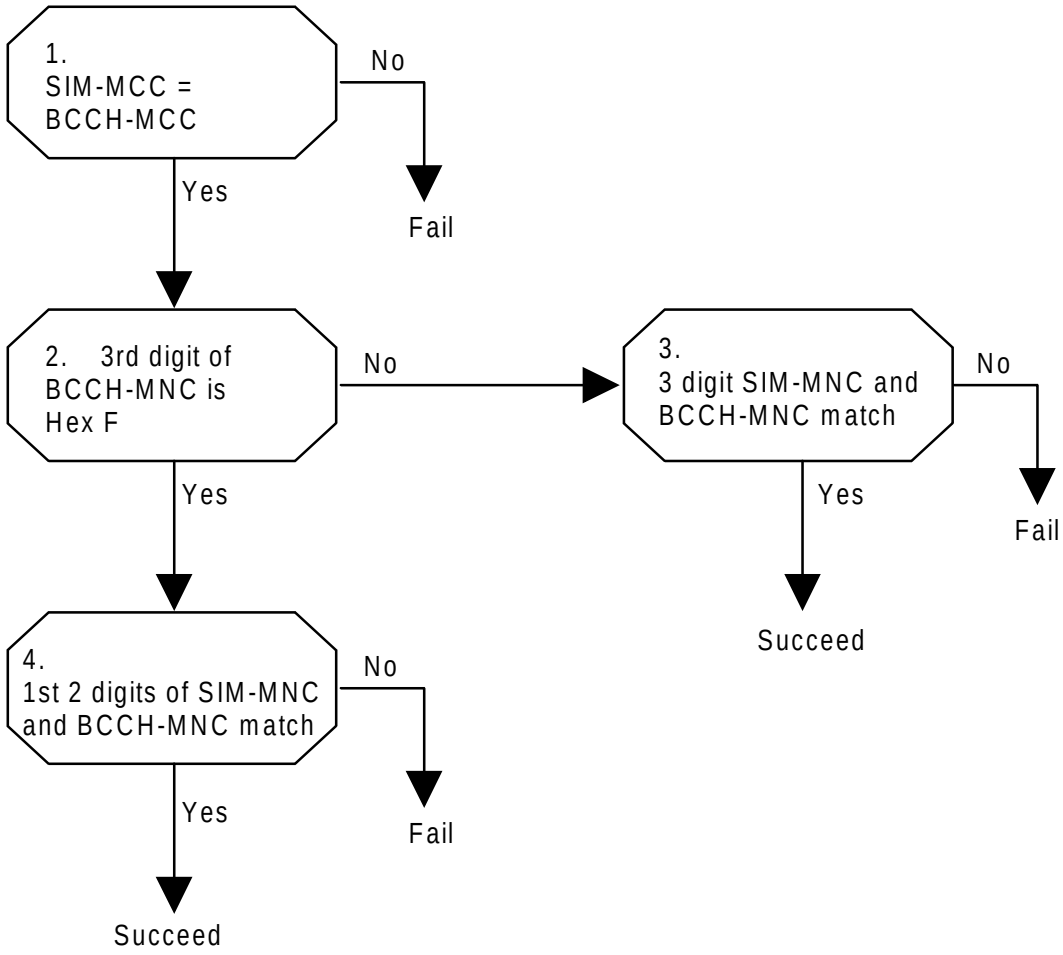


Figure A.1: HPLMN Matching Criteria Logic Flow for mobiles which support GSM and DCS1800 (informative)

HPLMN Matching Criteria for mobiles which support PCS1900 for NA:

Figure A.2 illustrates the logic flow described below. The text below is normative. The Figure A.2 is informative

(1) The MS shall compare using all 3 digits the SIM-MCC with the BCCH-MCC. If the values do not match, then the HPLMN match fails.

(2) The MS shall read the 3rd digit of the BCCH-MNC. If the 3rd digit is Hex F, then proceed to step (4).

(3) The MS shall compare using all 3 digits the SIM-MNC with the BCCH-MNC. If the values match, then the HPLMN match succeeds, otherwise the HPLMN match fails.

NOTE: These rules (1) – (3) are the same as for mobiles which don't support PCS1900 for NA, except step (4) is different.

(4) The MS shall determine if the BCCH-MCC lies in the range 310-316 (i.e., whether this network is a PCS1900 for NA network). If the BCCH-MCC lies outside the range 310-316, then proceed to step (6).

(5) The MS shall compare the 3rd digit of the SIM-MNC with '0'. If the 3rd digit is not '0' then the HPLMN match fails.

NOTE: This is the '0' suffix rule.

(6) The MS shall compare using just the 1st 2 digits of the SIM-MNC with the BCCH-MNC. If the values match, then the HPLMN match succeeds, otherwise the HPLMN match fails.

NOTE: When PCS1900 for NA switches over to broadcasting 3 digit MNCs in **all** networks, then the additional requirements for PCS1900 for NA can be deleted.

Guidance for Networks in PCS1900 for NA

There may be some problems in the transition period from broadcasting 2 MNC digits to broadcasting 3 MNC digits. Here are some guidelines to avoid these problems.

(1) Existing network codes. Operators who currently use a 2 digit BCCH-MNC **xy** should use the new code **xy0**.

(2) New operators allocated 3 digit MNC codes with the same 1st 2 digits as an existing operator shall not use a 3rd digit of 0.

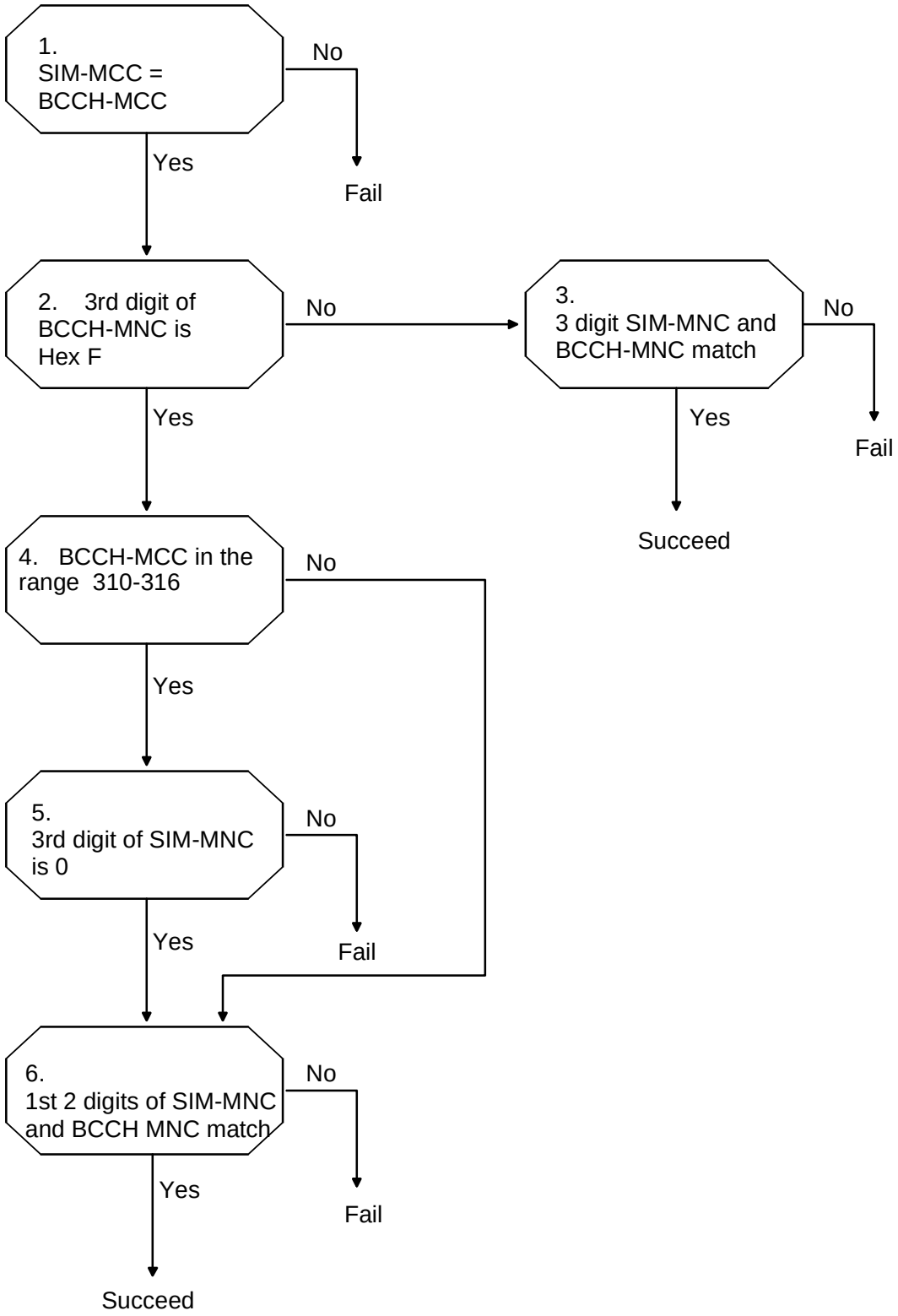


Figure A.2: HPLMN Matching Criteria Logic Flow for mobiles which support PCS1900 for NA (informative)

Annex B (informative): Change history

TSG#	Tdoc	SPEC	VER	CR	R	PHA	CA	NEW_	SUBJECT	comment
		03.22	8.2.0			R99			Split of 03.22/R99 to 03.22 and 23.122	
CN#6		23.122	0.0.0			R99		3.0.0		Was approved in the TSGN#6 plenary
CN#4	N1-99573	23.102	3.0.0	001		R99	F	3.1.0	PLMN selection for GPRS mobiles	Mirrored from CRA032r2 REMOVED in V3.1.1, where it is not approved by SMG2
CN#6	N1-99D13	23.122	3.0.0	002		R99	A	3.1.0	Correction of Figure A.2 in Annex A	Mirrored from CR006r1for 23.022

History

Document history		
V3.0.0	December 1999	Approved at TSGN #6 Under TSG CN Change Control. Document creation from splitting 03.22v8.2.0
V3.1.1	February 2000	Removal of CR 001 where it is not approved by SMG2