



Technical Document

GSM PROTOCOL STACK
MESSAGE SEQUENCE CHARTS
SMS

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2. Reading of Status report message stored in SIM or ME.

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1.2 Abbreviations

AGCH	Access Grant Channel
BCCH	Broadcast Control Channel
BS	Base Station
BSIC	Base Station Identification Code
CBCH	Cell Broadcast Channel
CBQ	Cell Bar Qualify
CC	Call Control
CCCH	Common Control Channel
CCD	Condat Coder Decoder
CKSN	Ciphering Key Sequence Number
C/R	Command / Response
C1	Path Loss Criterion
C2	Reselection Criterion
DCCH	Dedicated Control Channel
DISC	Disconnect Frame
DL	Data Link Layer
DM	Disconnected Mode Frame
EA	Extension Bit Address Field
EL	Extension Bit Length Field
EMMI	Electrical Man Machine Interface
F	Final Bit
FACCH	Fast Associated Control Channel
FHO	Forced Handover
GP	Guard Period
GSM	Global System for Mobile Communication
HPLMN	Home Public Land Mobile Network
I	Information Frame
IMEI	International Mobile Equipment Identity
IMSI	International Mobile Subscriber Identity
Kc	Authentication Key
L	Length Indicator
LAI	Location Area Information
LPD	Link Protocol Discriminator
M	More Data Bit
MCC	Mobile Country Code
MM	Mobility Management
MMI	Man Machine Interface
MNC	Mobile Network Code
MS	Mobile Station
NCC	National Colour Code
NECI	New Establishment Causes included
N(R)	Receive Number
N(S)	Send Number
OTD	Observed Time Difference

P	Poll Bit
PCH	Paging Channel
PDU	Protocol Description Unit
P/F	Poll / Final Bit
PL	Physical Layer
PLMN	Public Land Mobile Network
RACH	Random Access Channel
REJ	Reject Frame
RNR	Receive Not Ready Frame
RR	Radio Resource Management
RR	Receive Ready Frame
RTD	Real Time Difference
SABM	Set Asynchronous Balanced Mode
SACCH	Slow Associated Control Channel
SAP	Service Access Point
SAPI	Service Access Point Identifier
SDCCH	Slow Dedicated Control Channel
SIM	Subscriber Identity Module
SMS	Short Message Service
SMSCB	Short Message Service Cell Broadcast
SS	Supplementary Services
TCH	Traffic Channel
TCH/F	Traffic Channel Full Rate
TCH/H	Traffic Channel Half Rate
TDMA	Time Division Multiple Access
TMSI	Temporary Mobile Subscriber Identity
UA	Unnumbered Acknowledgement Frame
UI	Unnumbered Information Frame
VPLMN	Visiting Public Land Mobile Network
V(A)	Acknowledgement State Variable
V(R)	Receive State Variable
V(S)	Send State Variable

1.3 Terms

Entity	Program which executes the functions of a layer
Message:	A message is a data unit which is transferred between the entities of the same layer (peer-to-peer) of the mobile and infrastructure side. Message is used as a synonym to protocol data unit (PDU). A message may contain several information elements.
Primitive:	A primitive is a data unit which is transferred between layers on one component (mobile station or infrastructure). The primitive has an operation code which identifies the primitive and its parameters.
Service Access Point:	A Service Access Point is a data interface between two layers on one component (mobile station or infrastructure).

Overview

Different layers in the mobile station Protocol Stacks. It is also intended to offer an overview of the intersystem interface. The Protocol Stacks are used to define the functionality of the GSM protocols for interfaces. The GSM specifications are normative when used to describe the functionality of interfaces, but the stacks and the subdivision of protocol layers does not imply or restrict any implementation.

The base of the Protocol Stack rests on the physical layer.

The Data Link Layer (DL) is used to handle an acknowledged connection between mobile and base station. The LAPDm protocol is used.

Radio Resource (RR) manages the resources of the air-interface. That means configuration of physical layer, cell selection and cell reselection, data transfer, RR-Connection handling.

Mobility Management (MM) handles registration aspects for the mobile station. It detects changes of location areas and updates a mobile station in the new location area.

Call Control (CC) provides the call functionality. This includes call establishment, call maintenance procedures like Hold, Retrieve or Modify, and call disconnection.

Supplementary Services (SS) handles all call independent supplementary services like call forwarding or call barring.

Short Message Services (SMS) is used for sending and receiving point-to-point short messages. Additionally the reception of cell broadcast short messages is included.

The man machine interface (MMI) is the interface to the user. Normally it is connected with a keypad as input device and a display as output device.

Between the several entities data interfaces are defined. These data interfaces are called Service Access Points (SAPs), indicating that an upper layer uses the services of a lower layer.

The GSM specifications do not set out any implementation of the Protocol Stack. The following diagrams show the implementation described in all these documents for the mobile station. All entities except the Man Machine Interface and Physical Layer are implemented as part of the Protocol Stack.

This document describes the services offered by the short message service.

Introduction

Dynamic Configuration

Void

Timer Modes

Void

(SIM 1)

Starting with record 1 all SMS records are read. If the answer from the SIM application indicates that all records are read this procedure is finished.

(SMS 1)

The SIM application has read the requested record of the SIM card.

(SMS 2)

If it is a free record the status of the SMS message is stored.

(MMI 1)

If it is a mobile originated message, the status and the protocol identifier are stored from the SMS message. An indication is send to the MMI.

(MMI 2)

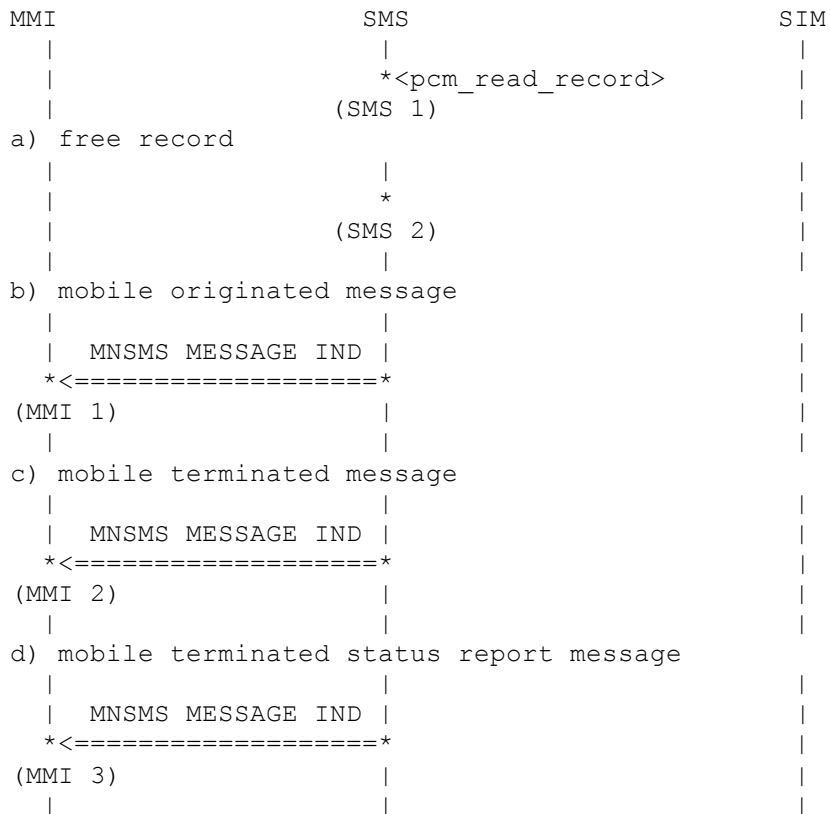
If it is a mobile terminated message, the status and the protocol identifier are stored from the SMS message. An indication is send to the MMI.

The status and protocol identifier backup for all SMS messages is used by SMS for faster access to the SIM card.

(MMI 3)

If it is a mobile terminated status report message, the status and the protocol identifier are not stored for this message, as only reading and deleting of the Status report message is allowed and not replacing of the message. An indication is sent to the MMI.

Reading SMS from Mobile Memory



(SMS 1)

Starting with record 1 all SMS records are read from the permanent configuration memory. If the answer from the permanent configuration memory indicates that all records are read this procedure is finished.

(SMS 2)

If it is a free record the status of the SMS message is stored.

(MMI 1)

If it is a mobile originated message, the status and the protocol identifier are stored from the SMS message. An indication is sent to the MMI.

(MMI 2)

If it is a mobile terminated message, the status and the protocol identifier are stored from the SMS message. An indication is sent to the MMI.

The status and protocol identifier backup for all SMS messages is used by SMS for faster access to the permanent configuration memory.

(MMI 3)

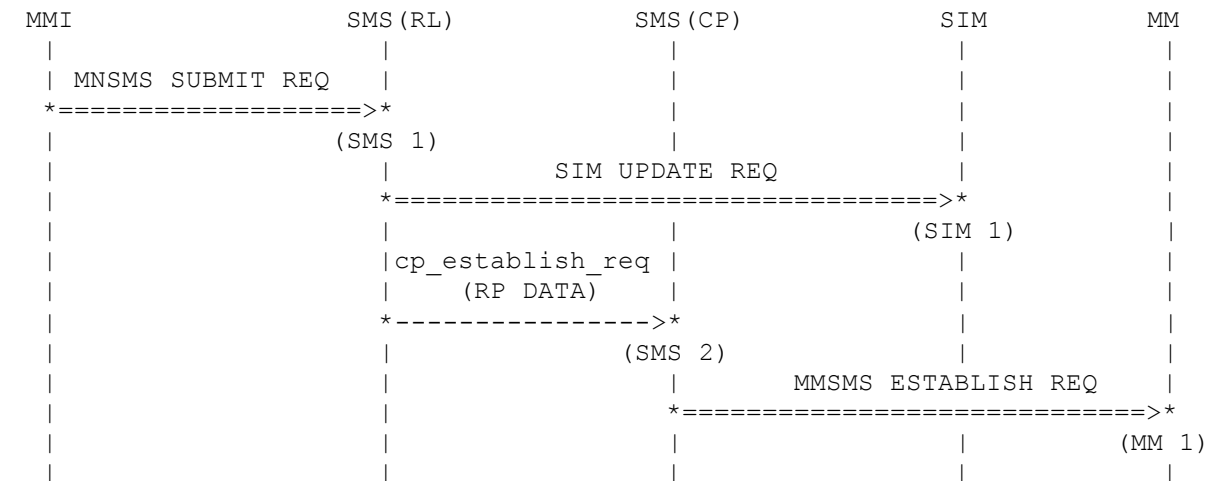
If it is a mobile terminated status report message, the status and the protocol identifier are not stored for this message, as only reading and deleting of the Status report message is allowed and not replacing of the message. An indication is sent to the MMI.

Mobile Originated Short Message Service

The mobile originated short message service enables the user to send a text message to the infrastructure. The receiving side is the so-called service centre (SC), which handles sending of the message to the destination address.

Establishment Phase

Initiation by Man Machine Interface



(SMS 1)

The user starts sending of a short message.

(SIM 1)

Each short message contains a message reference. This number is used to identify this short message for later transactions. The message reference is stored on the SIM card, if it is a phase 2/2+ SIM card.

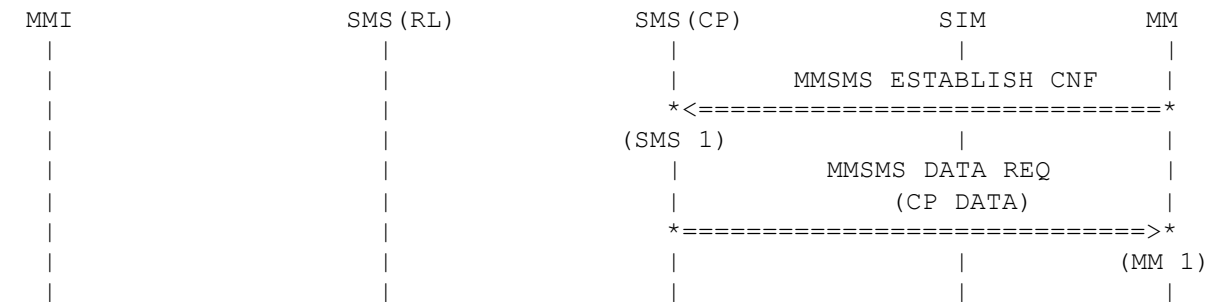
(SMS 2)

The RP DATA message is created and forwarded to the Control Protocol layer. The timer TR1M is started.

(MM 1)

The RP DATA message is stored and the establishment of the SMS-Connection is requested by MM.

Confirmation of SMS Connection



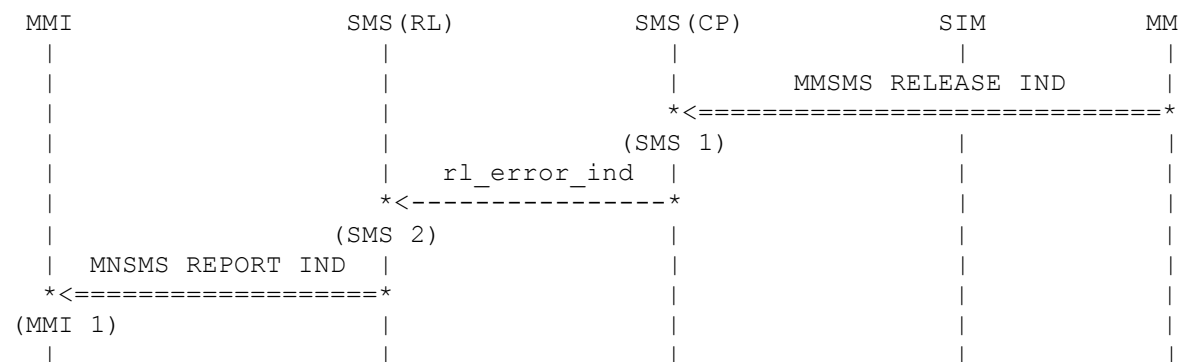
(SMS 1)

MM confirms the establishment of the SMS connection.

(MM 1)

The control protocol builds a CP DATA message containing the stored RP DATA message. The message is forwarded to MM. The timer T1CM is started to control the answer of the network. The retransmission counter is reset.

No SMS Connection established



(SMS 1)

MM indicates that the SMS-connection has not been established.

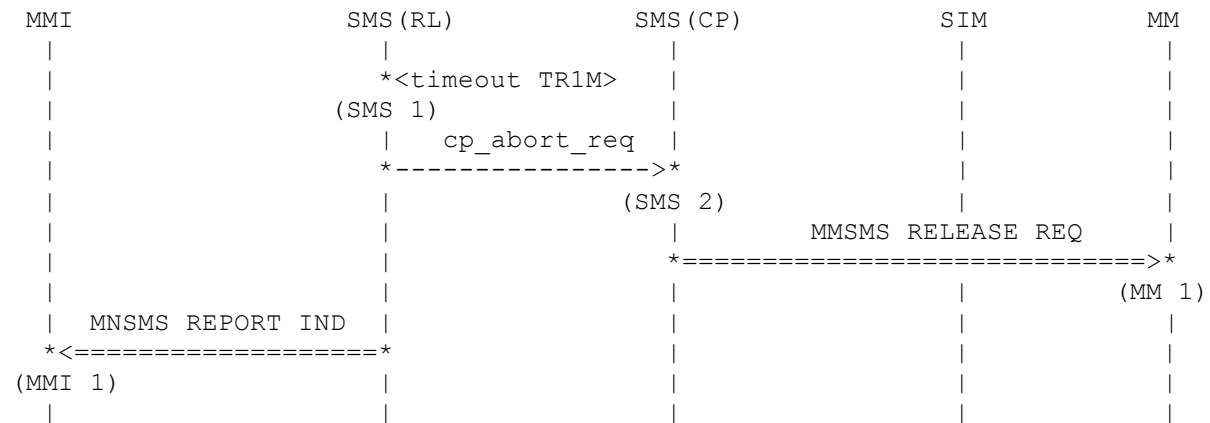
(SMS 2)

The control protocol indicates the error to the relay layer.

(MMI 1)

The error is reported to the user.

Timeout TR1M



(SMS 1)

In the relay layer the timer TR1M times-out. That means that no answer has received from the infrastructure.

(SMS 2)

The control protocol is informed about the abort.

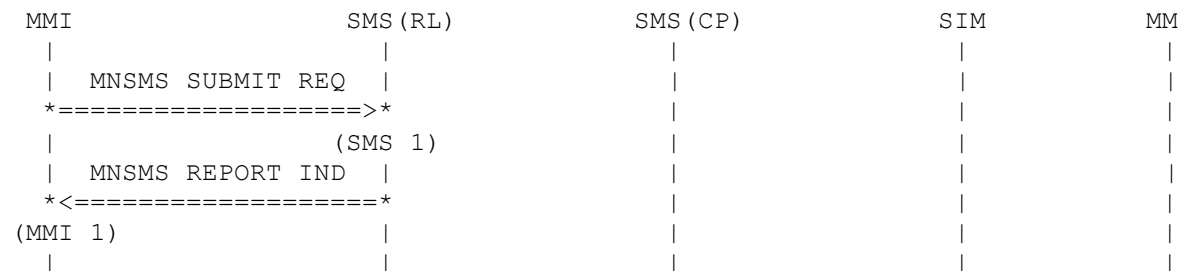
(MM 1)

The requested SMS connection is released.

(MMI 1)

The user is informed about the abort of the mobile originated short message service.

Multiple Request by Man Machine Interface



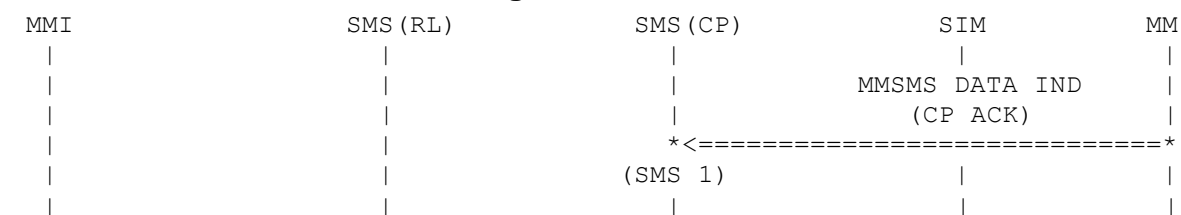
(SMS 1)

The user tries to send an additional mobile originated short message although the current transaction has not finished. At one time only one transaction is allowed.

(MMI 1)

The user is informed about rejection of the mobile originated short message request.

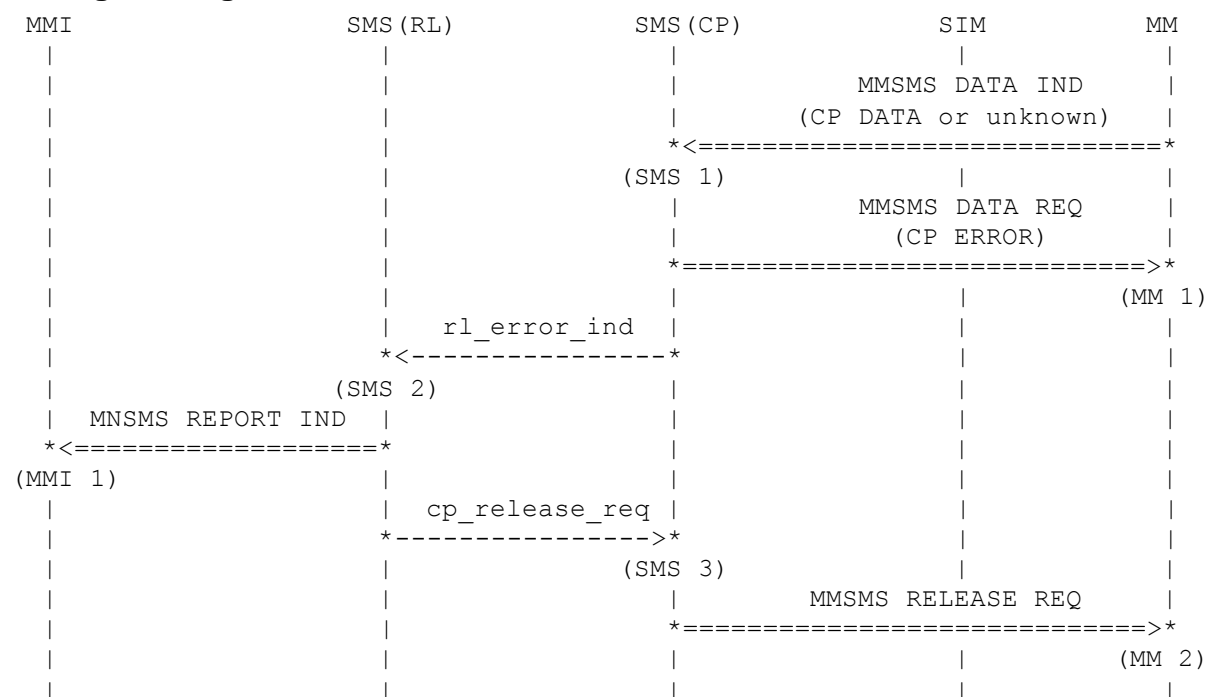
Confirmation to CP DATA Message



(SMS 1)

Control Protocol is in the state Wait for CP ACK. That means it waits for the acknowledgement of the previous CP-DATA message. This acknowledgment receives. The timer T1CM is stopped and Control Protocol enters the state SMS CONNECTION ESTABLISHED.

Wrong Message received



(SMS 1)

Control Protocol expects a CP ACK message as response to its own CP DATA message. Instead of this a CP DATA or unknown message receives. The timer T1CM is stopped.

(MM 1)

Control Protocol answers with a CP ERROR message and the cause #98 for a CP DATA message or #97 for an unknown message.

(SMS 2)

Relay Layer is informed about the error.

(MMI 1)

The user is informed about the error.

(SMS 3)

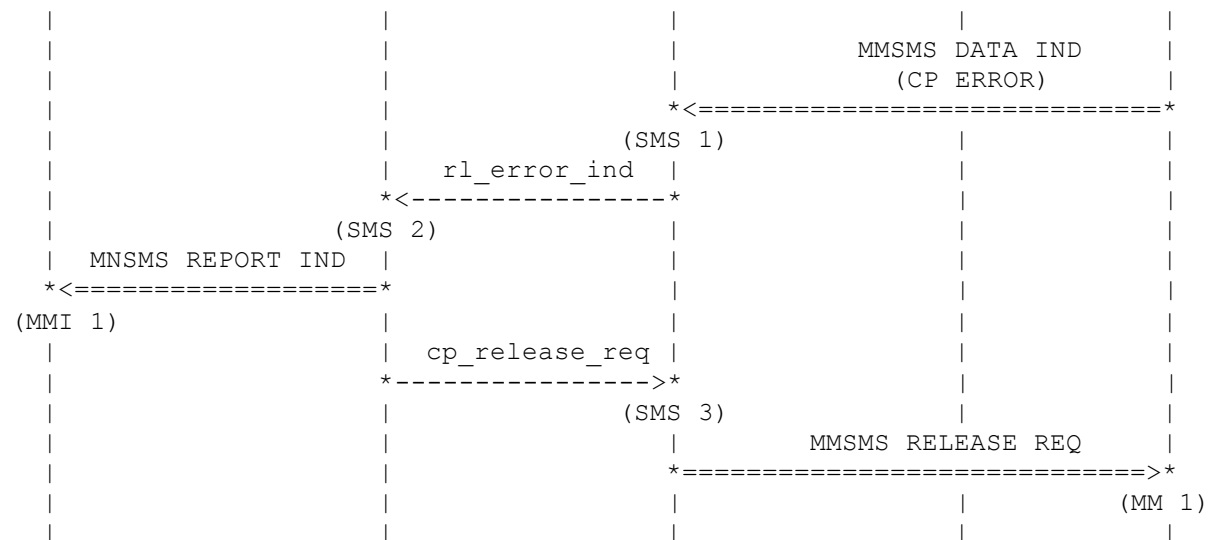
The SMS-Connection is not longer necessary and will be released.

(MM 2)

MM is informed about the release of the SMS connection.

CP Error received





(SMS 1)

Control Protocol expects a CP ACK message as response of its own previous CP DATA message. Instead a CP ERROR message receives. The timer T1CM is stopped.

(SMS 2)

The error cause is forwarded to the relay layer.

(MMI 1)

The user is informed about the error.

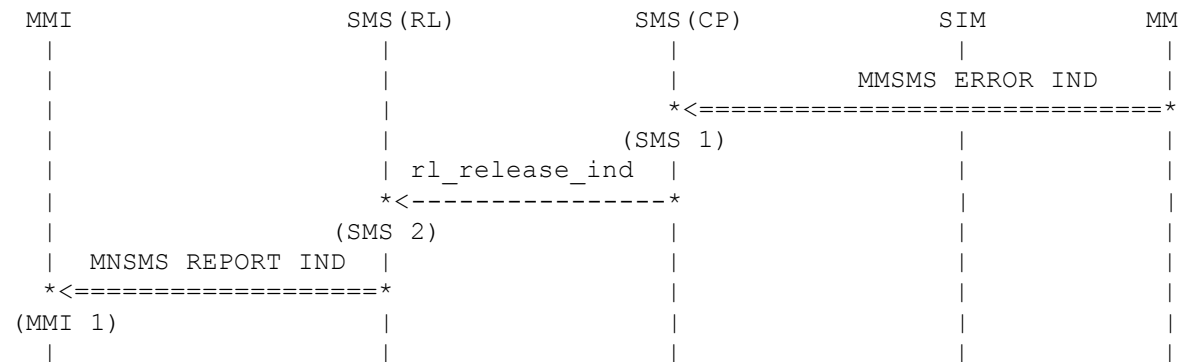
(SMS 3)

The release of the SMS connection is requested.

(MM 1)

MM is informed about the release of the SMS connection.

Lower Layer Failure



(SMS 1)

A lower layer is detected. The SMS connection is not longer valid.

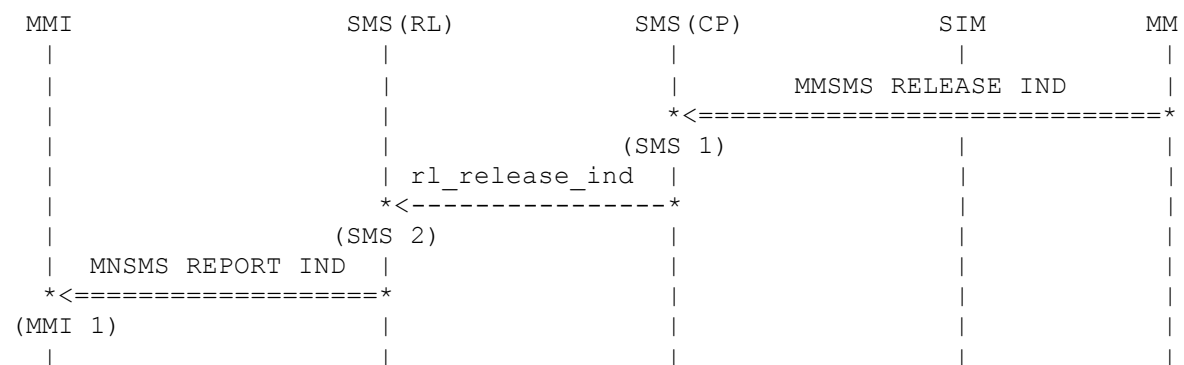
(SMS 2)

Relay layer is informed about the loss of connection.

(MMI 1)

The user is informed about the error.

Release of MM-Connection



(SMS 1)

The lower layer have released the connection. Control Protocol is informed.

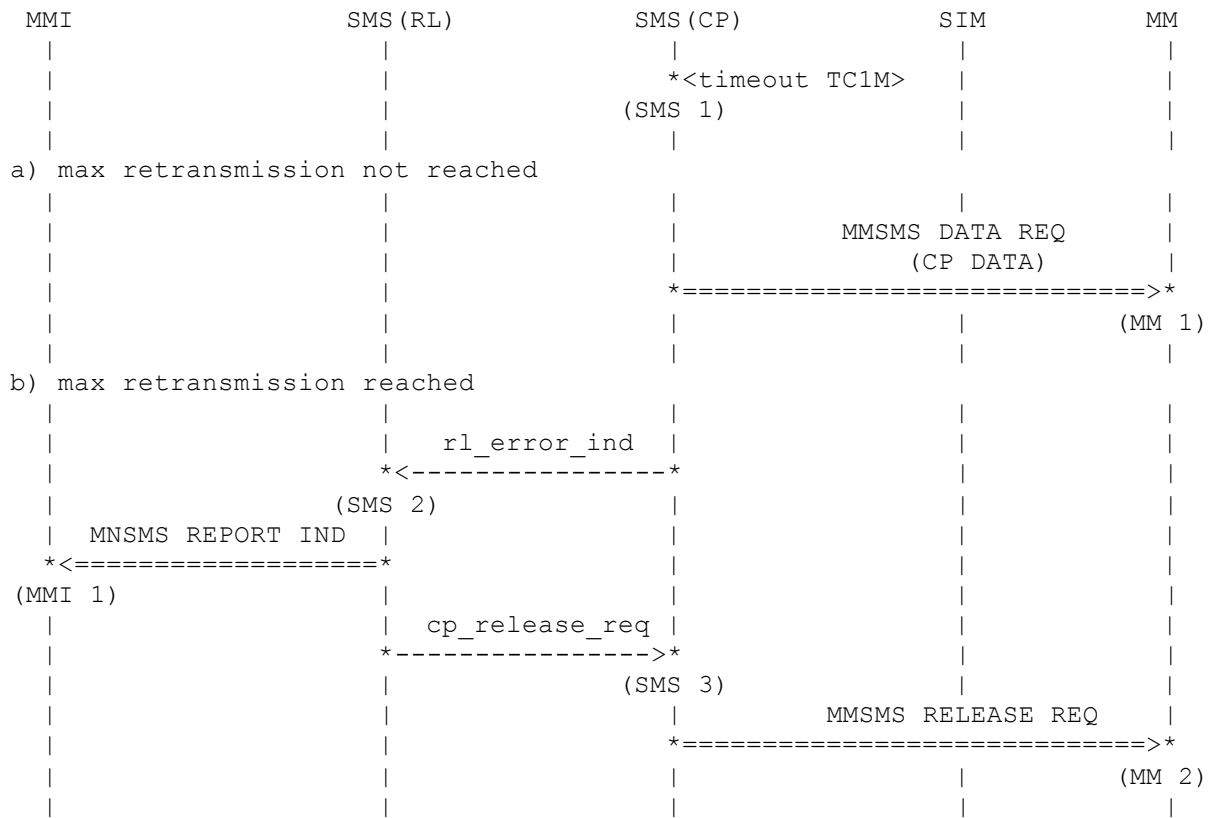
(SMS 2)

This information is forwarded to relay layer.

(MMI 1)

The user is informed about the error.

Timeout TC1M



(SMS 1)

The timer T1CM of the control protocol times-out.

(MM 1)

If this happens the first time, the CP DATA message is retransmitted.

(SMS 2)

The timeout occurs a second time. So the maximum of retransmissions is reached and the error is forwarded to the relay layer.

(MMI 1)

The user is informed about the error.

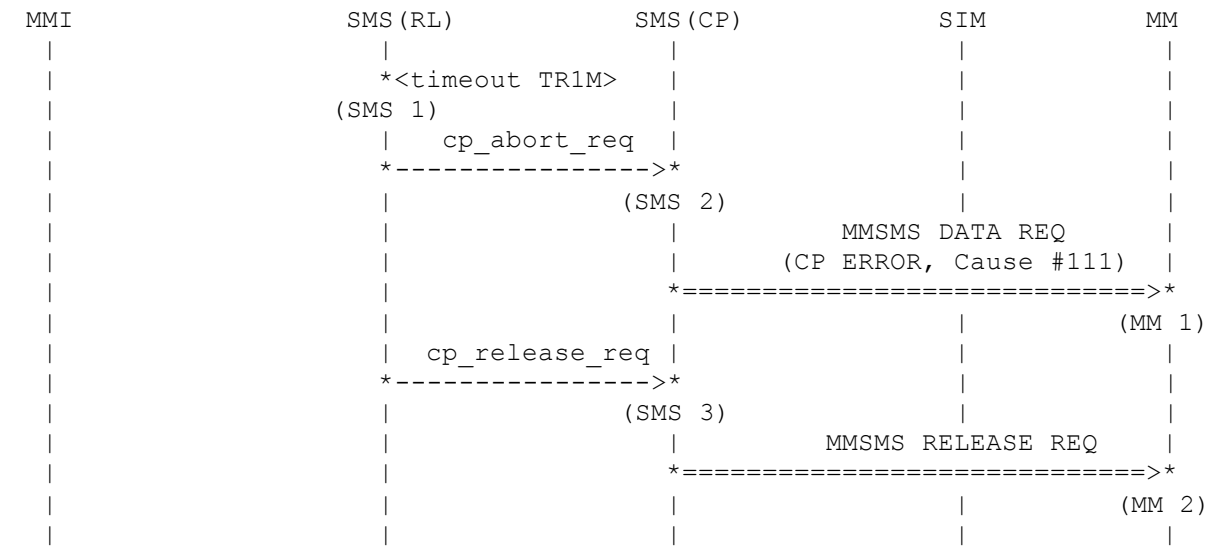
(SMS 3)

The SMS connection is not longer necessary. Relay layer requests the release of SMS connection.

(MM 2)

Control Protocol releases the SMS connection.

Timeout TR1M (SMS connection established)



(SMS 1)

A SMS connection is established. Then the timer T1RM of the relay layer expires.

(SMS 2)

The control protocol is informed about the abort.

(MM 1)

Control Protocol sends a CP ERROR message with the cause #111 to the infrastructure.

(SMS 3)

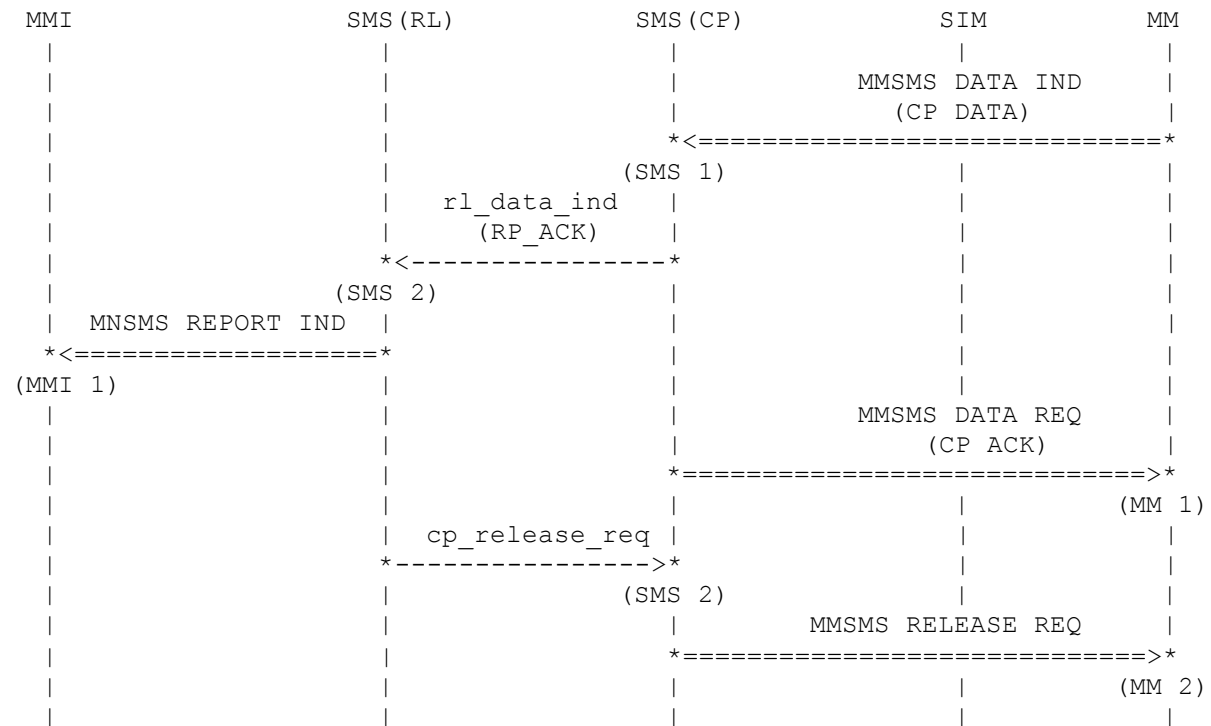
The relay layer requests the release of the SMS connection.

(MM 2)

The SMS connection is released.

Active Phase

Acknowledge of the Infrastructure



(SMS 1)

A SMS connection is established and the response of the network receives. It is a CP DATA message containing a RP ACK message.

(SMS 2)

The RP ACK message is forwarded to the relay layer.

(MMI 1)

The user is informed about the positive end of procedure.

(MM 1)

After reception of the CP DATA message control protocol sends a CP ACK message as response to the infrastructure.

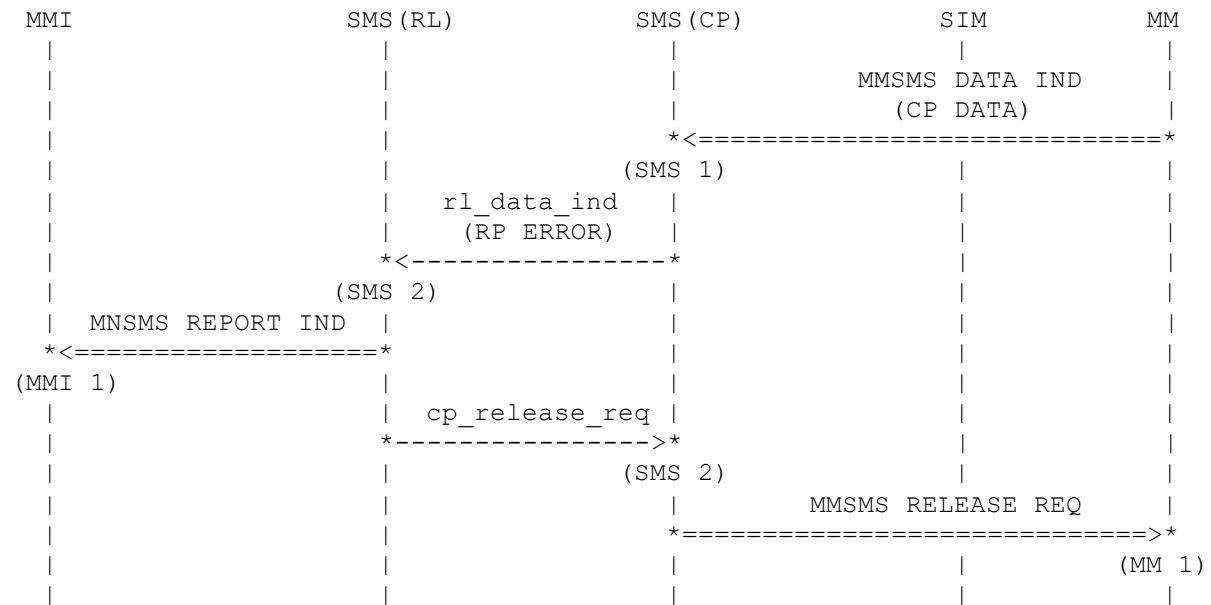
(SMS 2)

Relay Layer releases the SMS connection.

(MM 2)

The release of SMS connection is requested to MM.

Error signalled by the Infrastructure



(SMS 1)

A SMS connection is established and the response of the network receives. It is a CP DATA message containing a RP ERROR message.

(SMS 2)

The RP ERROR message is forwarded to the relay layer.

(MMI 1)

The user is informed about the negative end of procedure.

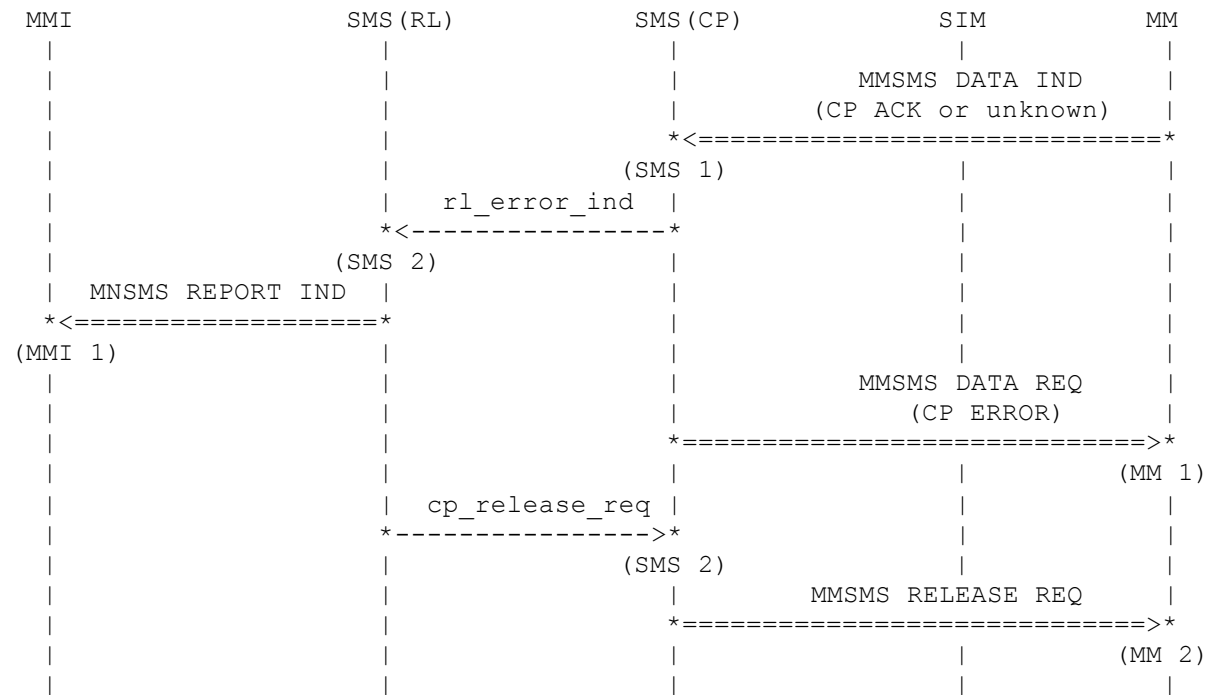
(SMS 2)

Relay Layer releases the SMS connection.

(MM 1)

The release of SMS connection is requested to MM.

Wrong Message signalled by the Infrastructure (CP layer)



(SMS 1)

A SMS connection is established and the response of the network receives. It is a CP ACK or an unknown message.

(SMS 2)

The error is forwarded to the relay layer.

(MMI 1)

The user is informed about the negative end of procedure.

(MM 1)

Control protocol sends a CP ERROR message as response to the infrastructure. The used cause is #97 for an unknown message and #98 for a CP ACK message.

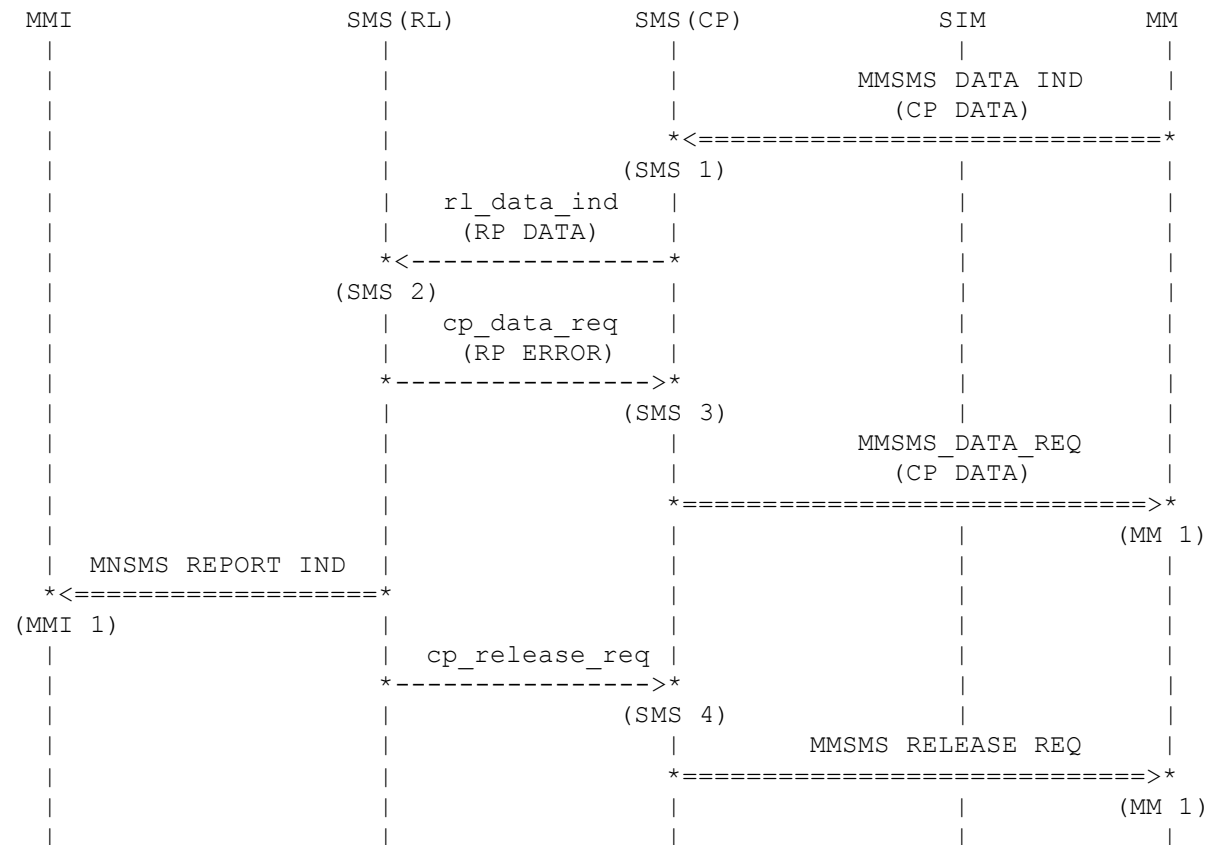
(SMS 2)

Relay Layer releases the SMS connection.

(MM 2)

The release of SMS connection is requested to MM.

Wrong Message signalled by the Infrastructure (RL layer)



(SMS 1)

A response of the infrastructure is expected. Control Protocol receives a CP DATA message.

(SMS 2)

This CP DATA message contains a RP DATA message instead of the expected RP ACK message.

(SMS 3)

Relay Layer builds a RP ERROR message and forwards it to the control protocol.

(MM 1)

The RP ERROR message is included into a CP DATA message and sent to the infrastructure.

(MMI 1)

The error is reported to the user.

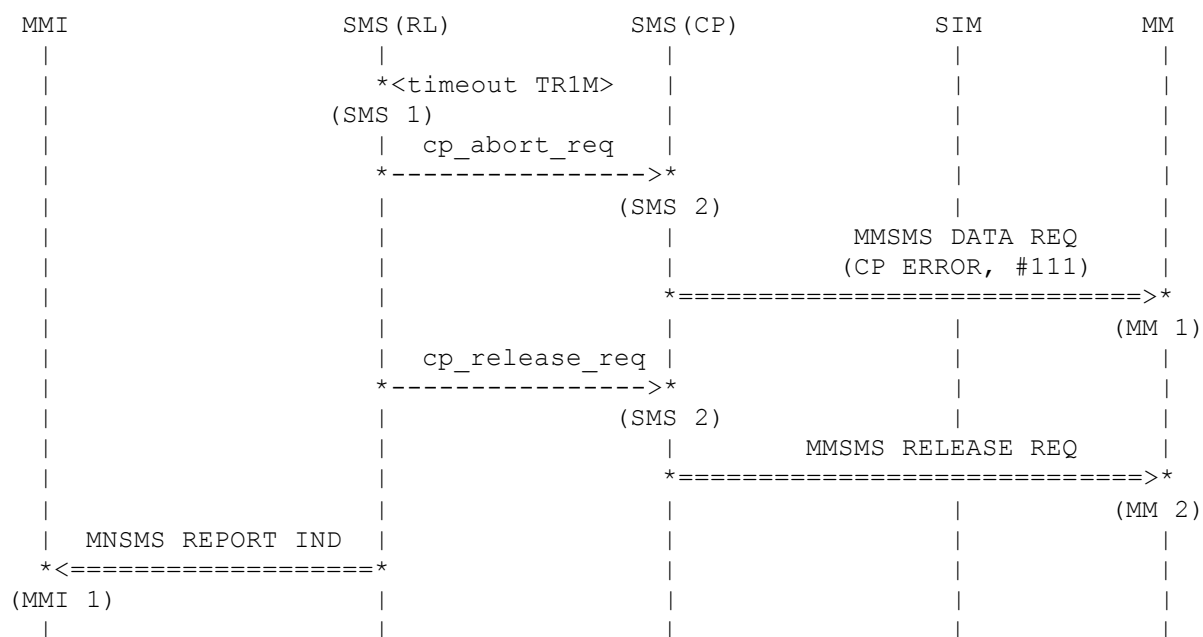
(SMS 4)

Relay Layer requests the release of the SMS connection.

(MM 1)

The SMS connection is released.

Timeout TR1M



(SMS 1)

SMS expects a response of the infrastructure. In the relay layer the timer TR1M timeout.

(SMS 2)

The abort of the SMS connection is requested to the control protocol.

(MM 1)

A CP ERROR message with the cause #111 is send to the infrastructure.

(SMS 2)

The SMS connection is not longer necessary.

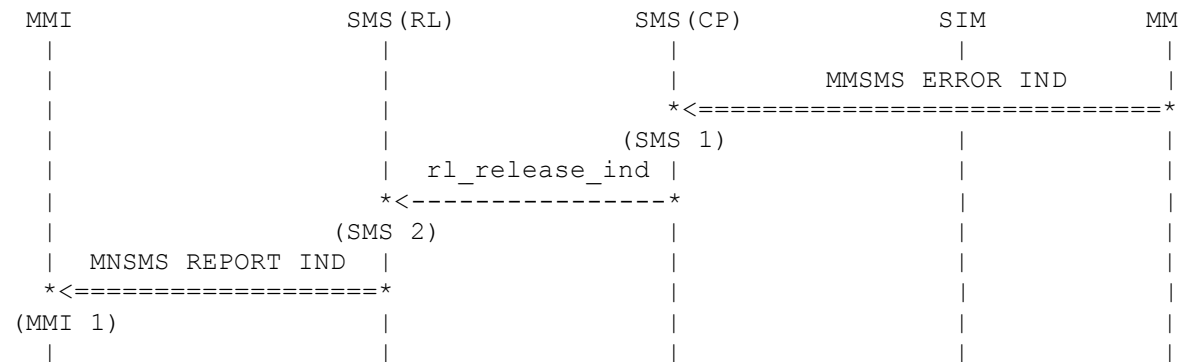
(MM 2)

The release of the SMS connection is requested to MM.

(MMI 1)

The user is informed about the error.

Lower Layer Failure



(SMS 1)

SMS expects a response of the infrastructure. Instead a lower layer failure is indicated.

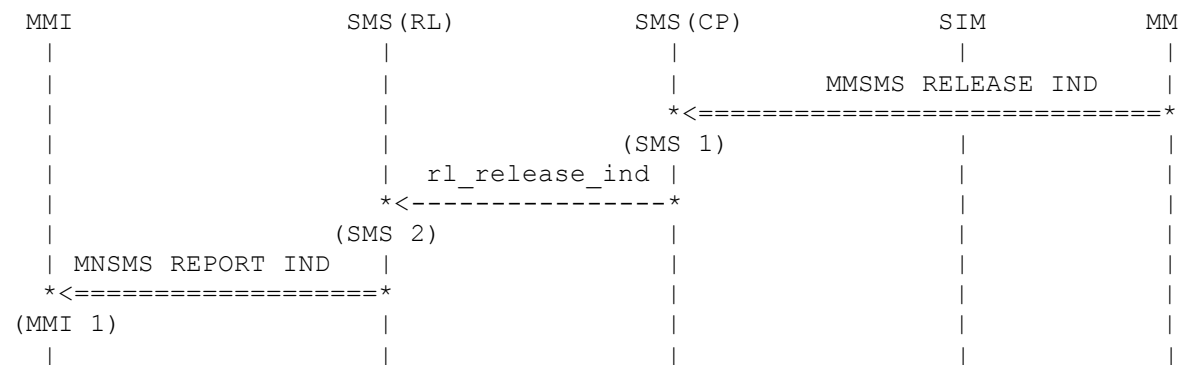
(SMS 2)

The release indication is forwarded to the relay layer.

(MMI 1)

The user is informed about the negative end of procedure.

Release of MM-Connection



(SMS 1)

SMS expects the response of the infrastructure. Instead the lower layer indicate the release of connection.

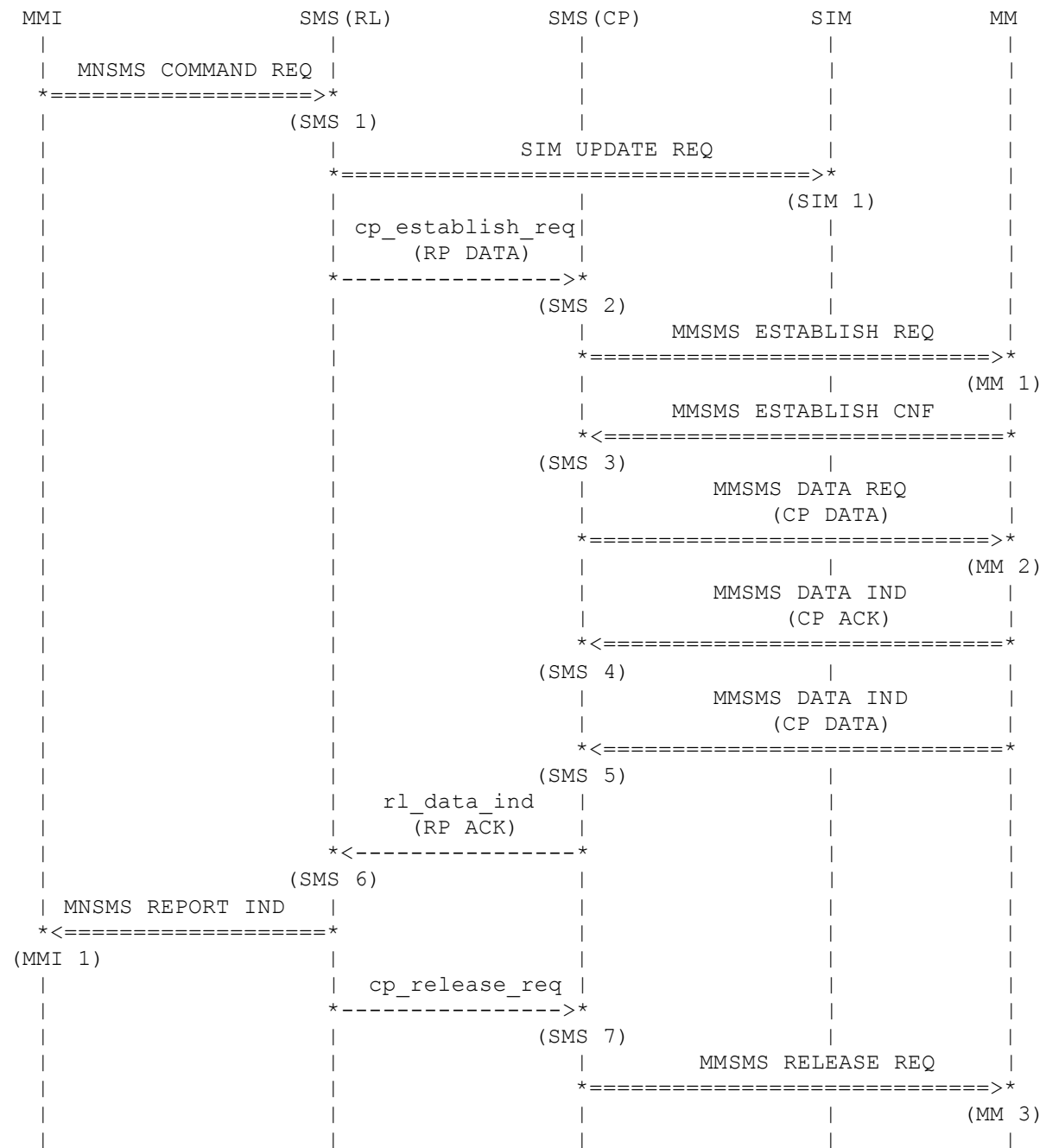
(SMS 2)

The release indication is forwarded to the relay layer.

(MMI 1)

The user is informed about the negative end of procedure.

Mobile Originated Short Message Command



(SMS 1)

The mobile originated short message command procedure is used to send commands to the service centre for previous sent short messages. The procedure differs from a mobile originated short message service procedure only in the different initial primitive.

The mobile station starts sending of a short message command. The following commands are available:

Status request for a short message

Delete of status report request for a short message and

Delete of a short message.

The named short message is identified by the message reference used for the short message

(SIM 1)

Each short message command has its own message reference. This number is used if other short message commands are related to this short message command. The message reference is incremented by one. If a phase 2 SIM is available the message reference is stored on the SIM card.

(SMS 2)

The relay layer builds a RP DATA message containing the short message command. The message is forwarded to the control protocol. The timer TR1M is started to supervise the response of the infrastructure.

(MM 1)

Control Protocol requests establishment of the SMS connection by MM.

(SMS 3)

MM confirms establishment of the SMS connection.

(MM 2)

The CP DATA message containing the RP DATA message of the relay layer is send to the infrastructure. The timer T1CM is started to supervise response of the infrastructure.

(SMS 4)

Control Protocol receives the response of the infrastructure. It is a CP ACK message. It now waits for the response for the relay layer.

(SMS 5)

A CP DATA message receives. The content for the relay layer is decoded.

(SMS 6)

The content of the message is a RP ACK message.

(MMI 1)

The user is informed about the positive end of procedure.

(SMS 7)

The connection release is requested.

(MM 3)

The SMS connection is released.

Mobile Terminated Short Message Service

With the mobile terminated short message service it is possible to send a textual message from the infrastructure to the mobile station. This message contains the data coding scheme describing the message class.

Additionally it is possible to configure the preferred memory (SIM or mobile equipment (ME) memory) and the used mode (MT = 0 .. 3) according the AT command +CNMI. If nothing is configured SMS prefers SIM card memory and MT is set to 4.

The following tables show the handling in the relay layer of short message service with the following meanings:

- DISPLAY forward directly to MMI
- MEM_ME store in ME memory
- MEM_SIM store in SIM memory
- NOTHING do nothing

SMS differs between the following data coding schemes:

- NO CLASS
- CLASS 0
- CLASS 1
- CLASS 2
- CLASS 3
- DISCARD Mail-Waiting Indicator, discard message
- STORE Mail-Waiting Indicator, store message

The first action if the preferred memory is ME memory is carried out according the following table:

MT	NO CLASS	CLASS 0	CLASS 1	CLASS 2	CLASS 3	DISCARD	STORE
0	MEM_ME	DISPLAY	MEM_ME	MEM_SM	MEM_ME	DISPLAY	MEM_ME
1	MEM_ME	DISPLAY	MEM_ME	MEM_SM	MEM_ME	DISPLAY	MEM_ME
2	DISPLAY	DISPLAY	DISPLAY	MEM_SM	DISPLAY	DISPLAY	MEM_ME
3	MEM_ME	DISPLAY	MEM_ME	MEM_SM	DISPLAY	DISPLAY	MEM_ME
4 (default)	MEM_SM	DISPLAY	MEM_ME	MEM_SM	MEM_SM	DISPLAY	MEM_SM

The second action if the preferred memory is ME memory is carried out according the following table:

MT	NO CLASS	CLASS 0	CLASS 1	CLASS 2	CLASS 3	DISCARD	STORE
0	NOTHING	NOTHING	MEM_SM	MEM_ME	MEM_SM	NOTHING	NOTHING
1	NOTHING	NOTHING	MEM_SM	MEM_ME	MEM_SM	NOTHING	NOTHING
2	NOTHING	NOTHING	NOTHING	MEM_ME	NOTHING	NOTHING	NOTHING
3	NOTHING	NOTHING	MEM_SM	MEM_ME	NOTHING	NOTHING	NOTHING
4 (default)	NOTHING	NOTHING	MEM_SM	MEM_ME	MEM_ME	NOTHING	NOTHING

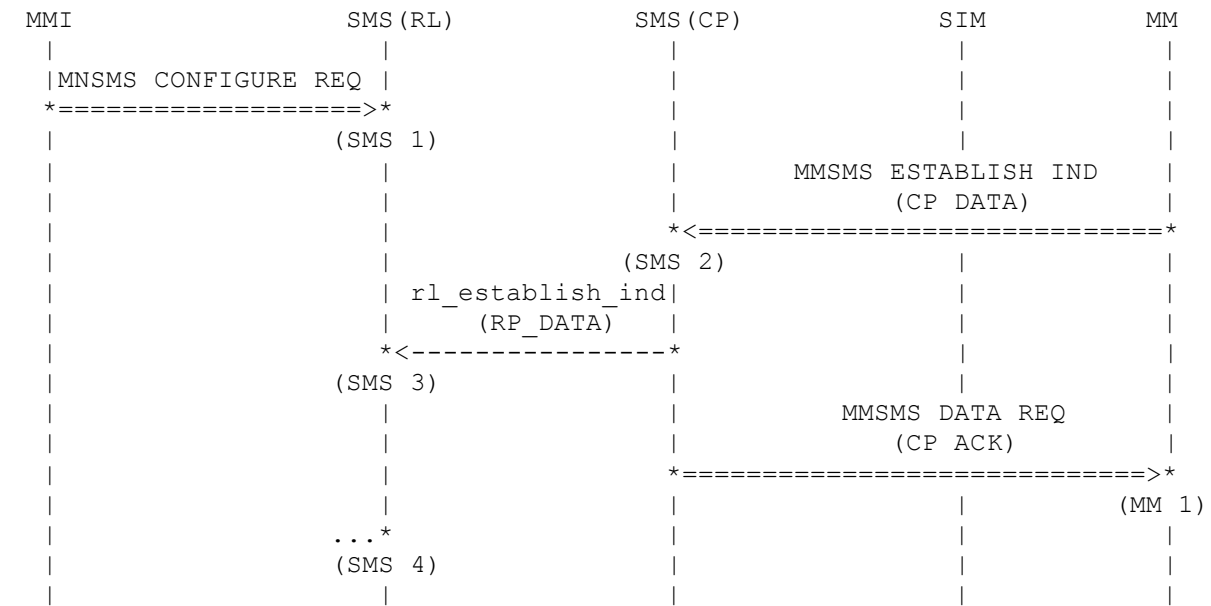
The first action if the preferred memory is SIM memory is carried out according the following table:

MT	NO CLASS	CLASS 0	CLASS 1	CLASS 2	CLASS 3	DISCARD	STORE
0	MEM_SM	DISPLAY	MEM_SM	MEM_SM	MEM_SM	DISPLAY	MEM_SM
1	MEM_SM	DISPLAY	MEM_SM	MEM_SM	MEM_SM	DISPLAY	MEM_SM
2	DISPLAY	DISPLAY	DISPLAY	MEM_SM	DISPLAY	DISPLAY	MEM_SM
3	MEM_SM	DISPLAY	MEM_SM	MEM_SM	DISPLAY	DISPLAY	MEM_SM
4 (default)	MEM_SM	DISPLAY	MEM_ME	MEM_SM	MEM_SM	DISPLAY	MEM_SM

The second action if the preferred memory is SIM memory is carried out according the following table:

MT	NO CLASS	CLASS 0	CLASS 1	CLASS 2	CLASS 3	DISCARD	STORE
0	NOTHING	NOTHING	MEM_ME	MEM_ME	MEM_ME	NOTHING	NOTHING
1	NOTHING	NOTHING	MEM_ME	MEM_ME	MEM_ME	NOTHING	NOTHING
2	NOTHING	NOTHING	NOTHING	MEM_ME	NOTHING	NOTHING	NOTHING
3	NOTHING	NOTHING	MEM_ME	MEM_ME	NOTHING	NOTHING	NOTHING
4 (default)	NOTHING	NOTHING	MEM_SM	MEM_ME	MEM_ME	NOTHING	NOTHING

Reception of a Short Message



(SMS 1)

MMI configures the reception modes for mobile terminated short messages.

(SMS 2)

MM indicates establishment of a SMS connection. This initial primitive contains a CP DATA message.

(SMS 3)

The content of the CP DATA message is a RP DATA message that is forwarded to the Relay Layer.

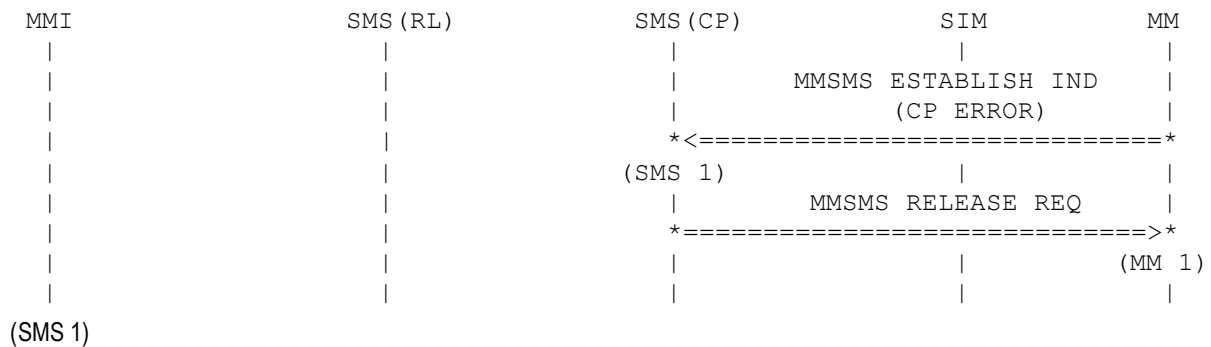
(MM 1)

Control Protocol sends a CP ACK message as acknowledgement to the infrastructure.

(SMS 4)

The following handling of the mobile terminated short message depends on the protocol identifier and the data coding scheme of the message and of the configured modes by MMI.

Reception of CP ERROR message

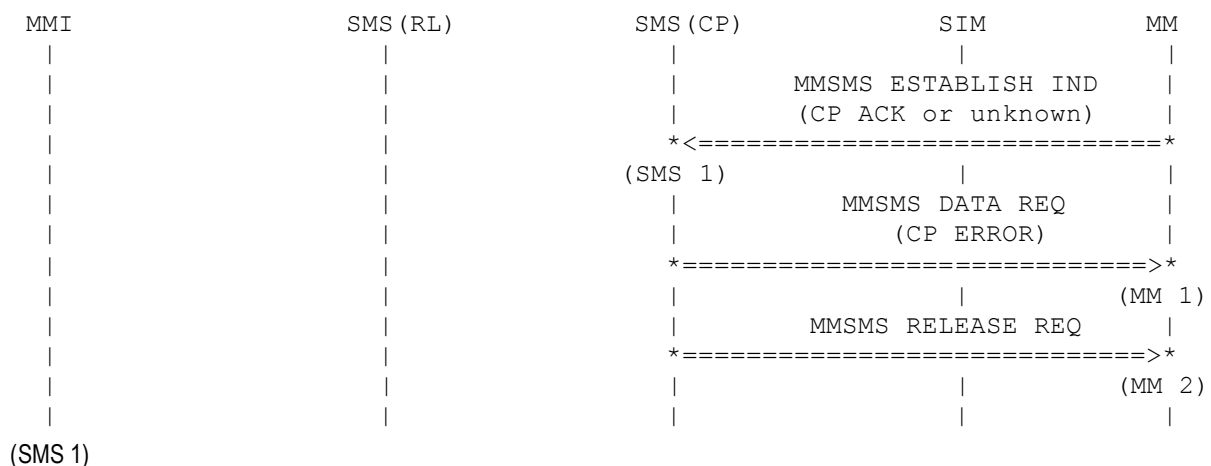


MM indicates a new SMS connection. The incoming message is a CP ERROR message. The message is ignored.

(MM 1)

The SMS connection is released.

Reception of CP ACK or unknown message



A new SMS connection is indicated by MM. The incoming message is CP ACK or unknown.

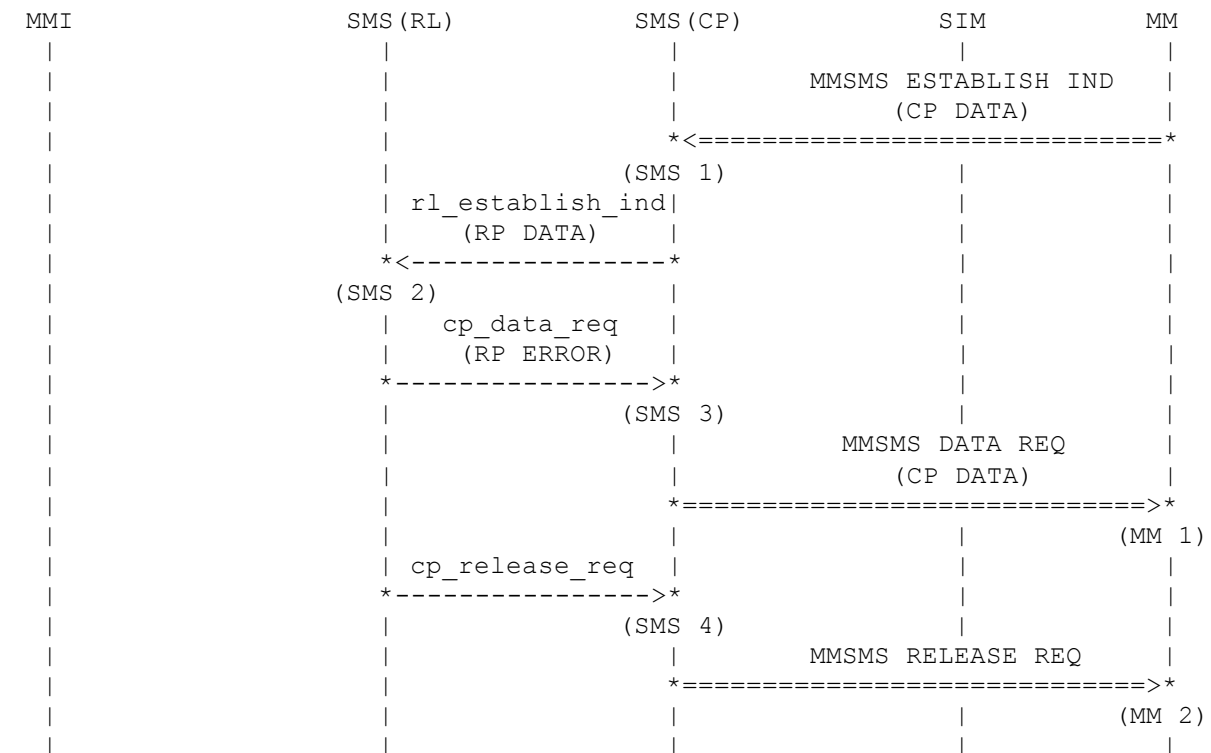
(MM 1)

Control Protocol builds a CP ERROR message with cause #97 for an unknown message and #98 for a CP ACK message.

(MM 2)

The SMS Connection is released.

Second Mobile Terminated Connection



(SMS 1)

MM indicates a second mobile terminated short message connection with a CP DATA message.

(SMS 2)

The content of the CP DATA message is forwarded to the Relay Layer.

(SMS 3)

Only one terminated transaction is allowed in parallel. So a RP ERROR message is build by the Relay Layer and forwarded to the Control Protocol.

(MM 1)

The message is included into a CP DATA message and sent to the infrastructure.

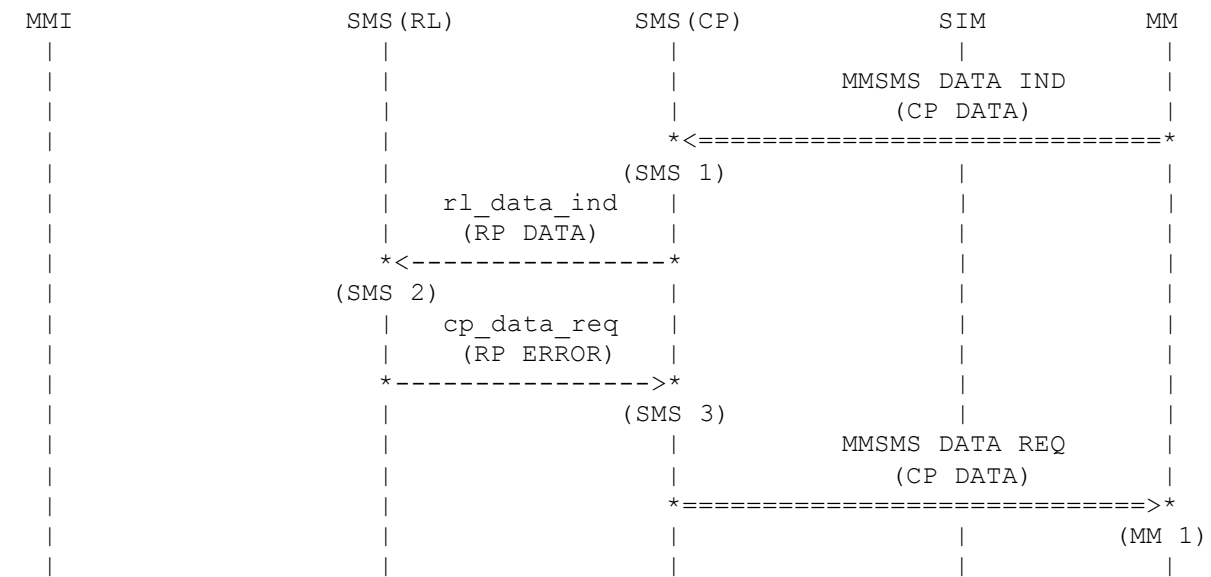
(SMS 4)

The Relay Layer releases the SMS connection.

(MM 2)

The release request is forwarded to MM.

Additional Message for Mobile Terminated Connection



(SMS 1)

Control Protocol receives additional CP DATA messages for an existing transaction.

(SMS 2)

The content of this CP DATA message is a RP DATA message. It is forwarded to the Relay Layer.

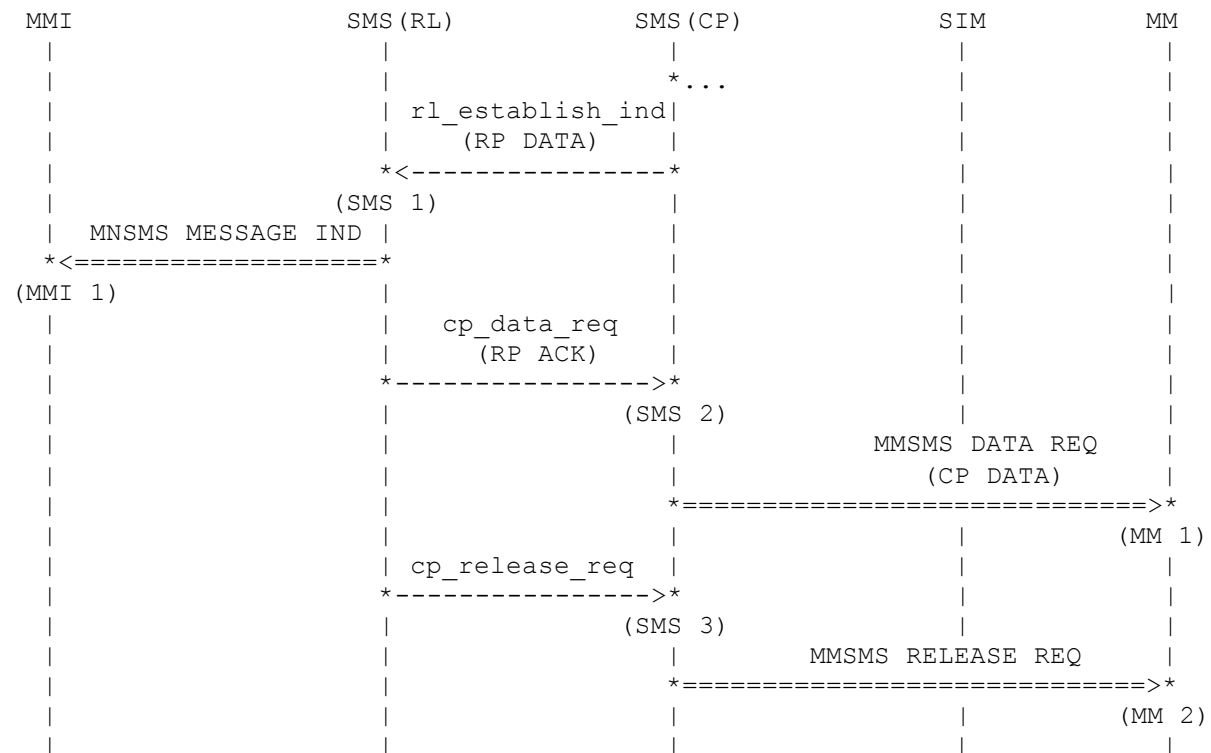
(SMS 3)

The relay layer builds a RP ERROR message and sends it back to the Control Protocol.

(MM 1)

This message is part of a CP DATA message that is forwarded to the infrastructure.

Display Message



(SMS 1)

The incoming mobile terminated short message receives in the Relay Layer. Depending on the protocol identifier, the data coding scheme and the configured modes SMS decides that the message shall be displayed immediately and not stored.

(MMI 1)

The message is displayed to the user.

(SMS 2)

Relay Layer builds a RP ACK message and sent it to Control Protocol.

(MM 1)

The message is part of a CP DATA message that is build by Control Protocol. The message is sent to the infrastructure.

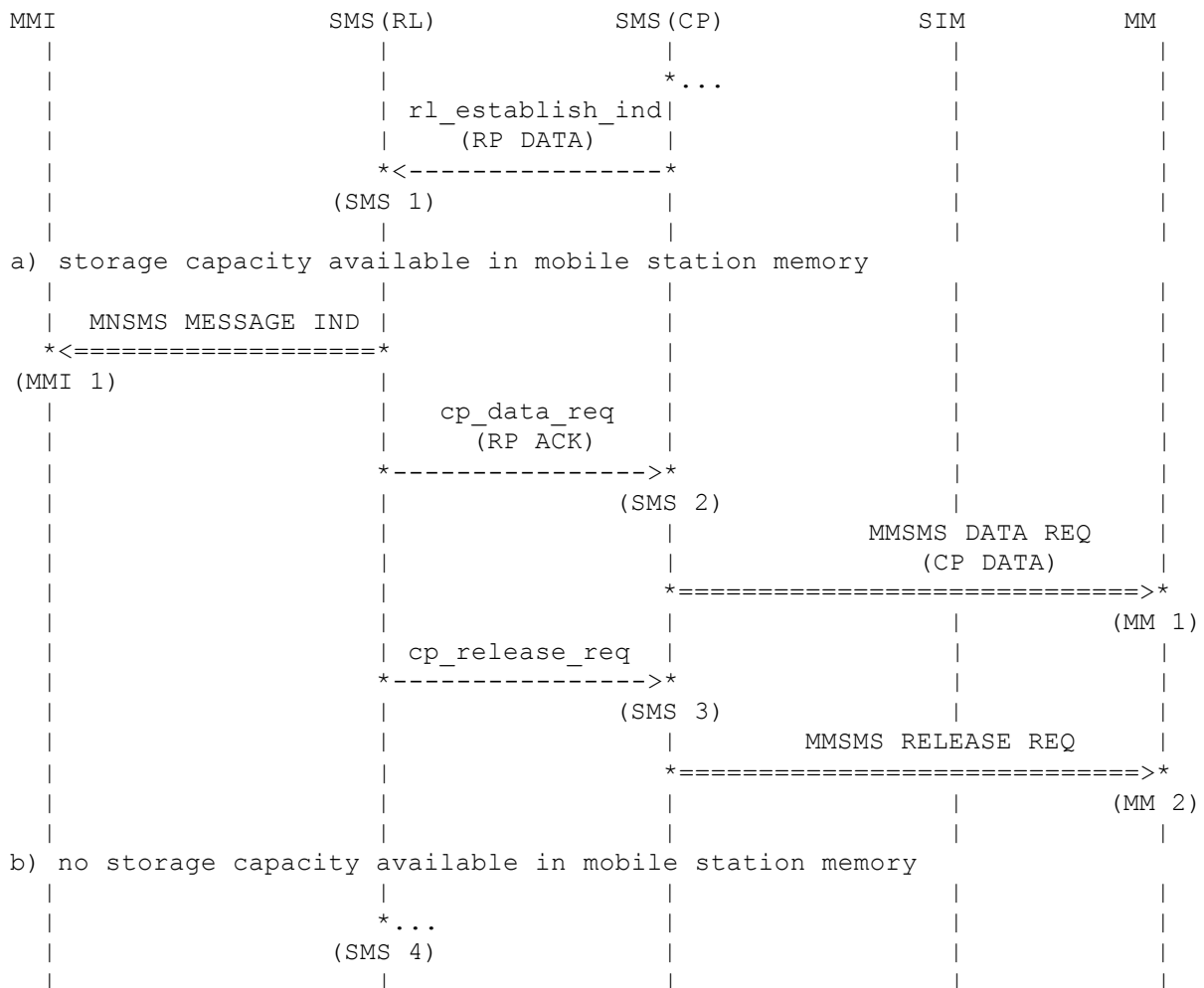
(SMS 3)

The Relay Layer releases the SMS connection.

(MM 2)

The release of SMS connection is forwarded to MM.

Store Message in ME memory



(SMS 1)

The incoming mobile terminated short message receives in the Relay Layer. Depending on the protocol identifier, the data coding scheme and the configured modes SMS decides that the message shall be stored in the ME memory.

(MMI 1)

The message is stored in the memory of the mobile station. An indication is sent to the user. The user can read the message with the SMS read procedure.

(SMS 2)

Relay Layer codes a RP ACK message and forwards it to the Control Protocol.

(MM 1)

The RP ACK message is part of the CP DATA message that is sent to the infrastructure.

(SMS 3)

The existing SMS-Connection is not longer necessary. The Relay Layer requests the release.

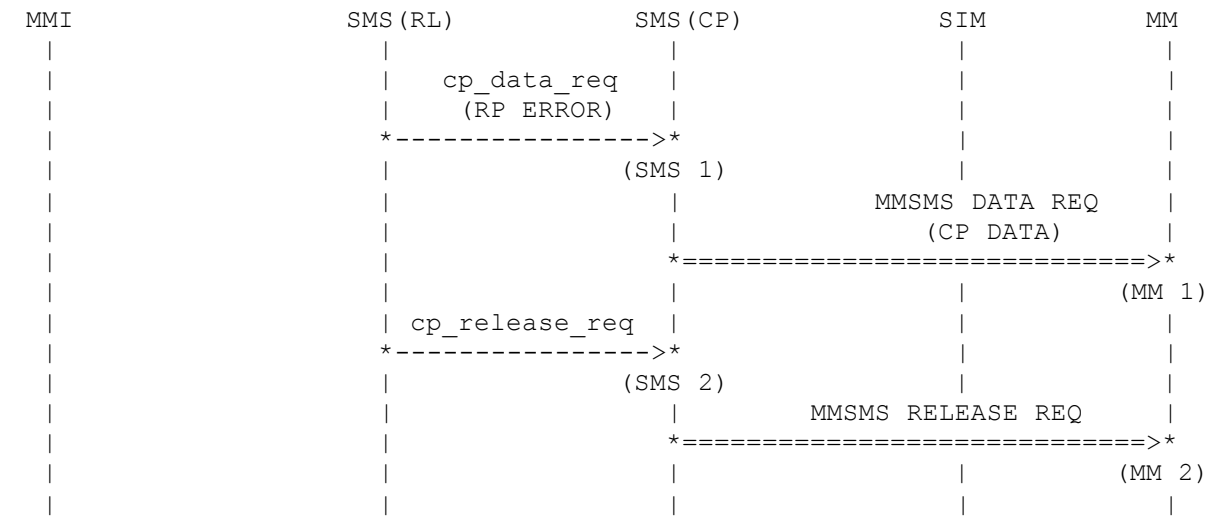
(MM 2)

The release of SMS connection is send to MM.

(SMS 4)

If no free entry is available in the mobile station memory, the relay layer starts the second action defined for this type of message or sends an error indication to the network as described in the next chapter.

No Storage available on ME memory, no other opportunities



(SMS 1)

The error, that no memory is available is coded in a RP ERROR message and forwarded to the CP layer.

(MM 1)

The RP ERROR message is filled in a CP DATA message and forwarded to the infrastructure.

(SMS 2)

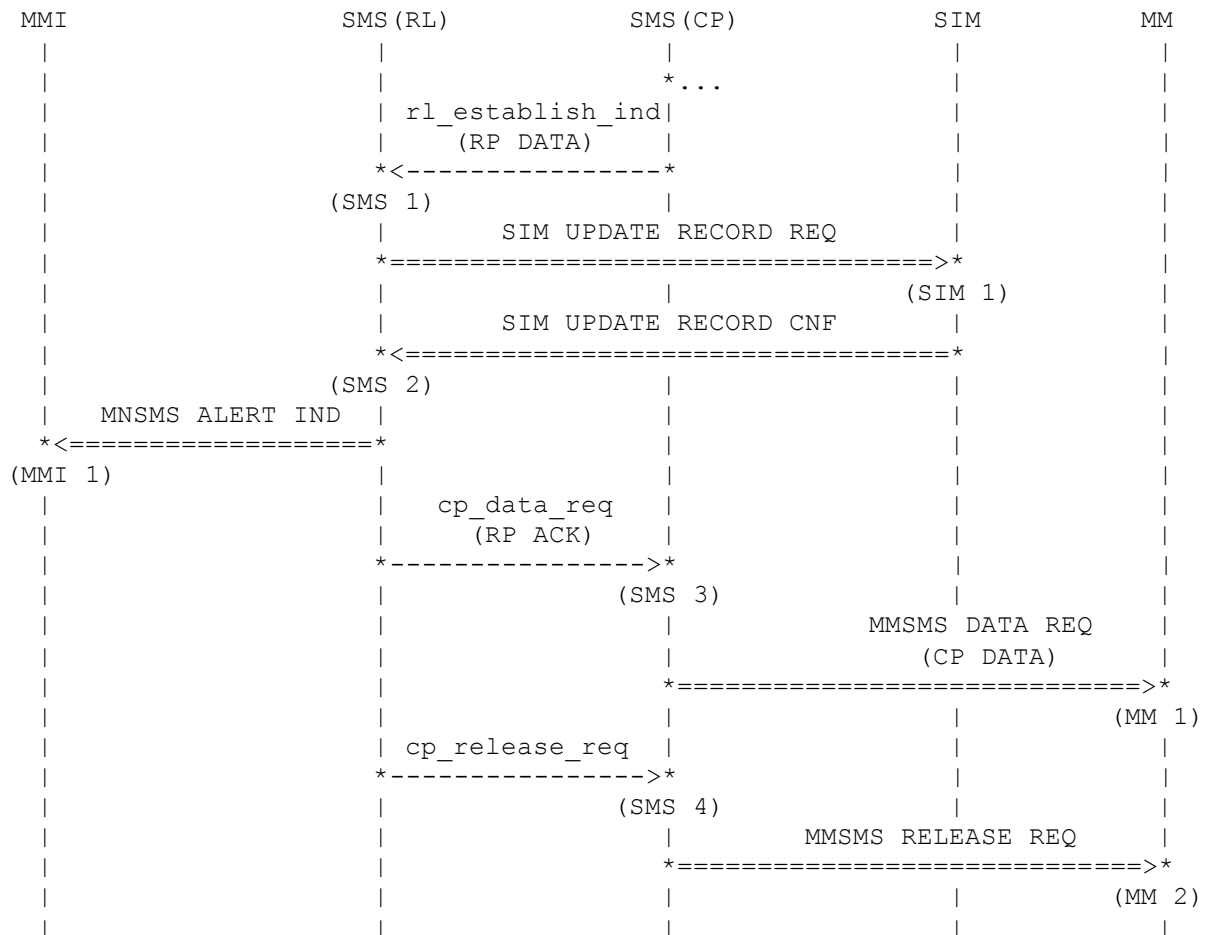
The RL layer will release the SMS connection.

(MM 2)

MM is informed about the release of the SMS connection.

Store Message in SIM memory

Storage on SIM available, writing successful



(SMS 1)

The incoming mobile terminated short message receives in the Relay Layer. Depending on the protocol identifier, the data coding scheme and the configured modes SMS decides that the message shall be stored in the SIM memory. Using the backup of SMS status bytes from the SIM card a free record is found.

(SIM 1)

The SMS message is written to this record.

(SMS 2)

SMS receives the confirmation of writing the SMS message to the SIM memory.

(MMI 1)

An indication is send to the user. The user can read the message with the SMS read procedure.

(SMS 3)

Relay Layer codes a RP ACK message and forwards it to the Control Protocol.

(MM 1)

The RP ACK message is part of the CP DATA message that is sent to the infrastructure.

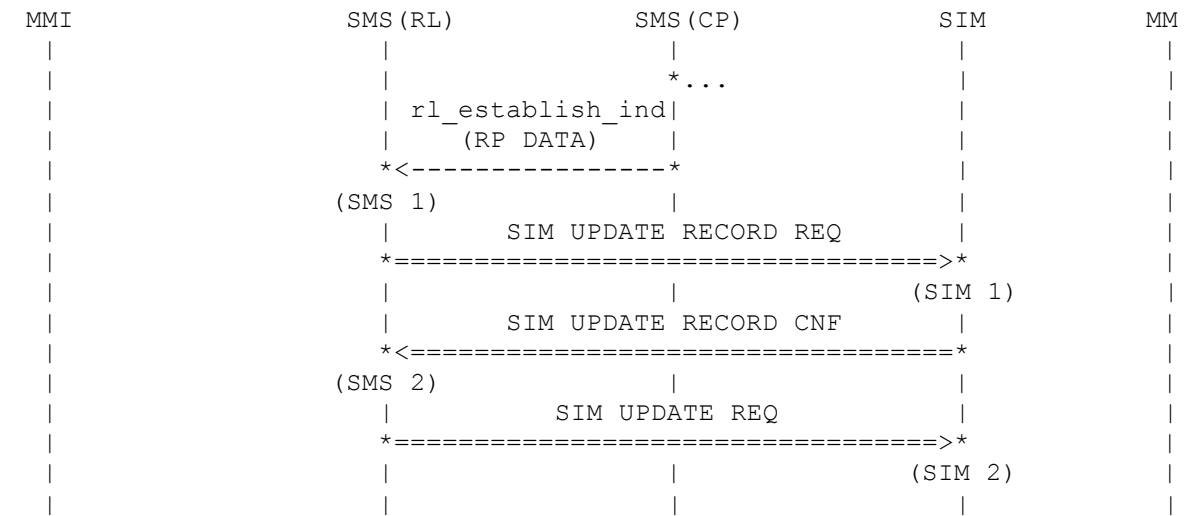
(SMS 4)

The existing SMS-Connection is not longer necessary. The Relay Layer requests the release.

(MM 2)

The release of SMS connection is send to MM.

Storage on SIM available, writing not successful



(SMS 1)

The incoming mobile terminated short message receives in the Relay Layer. Depending on the protocol identifier, the data coding scheme and the configured modes SMS decides that the message shall be stored in the SIM memory. Using the backup of SMS status bytes from the SIM card a free record is found.

(SIM 1)

The SMS message is written to this record.

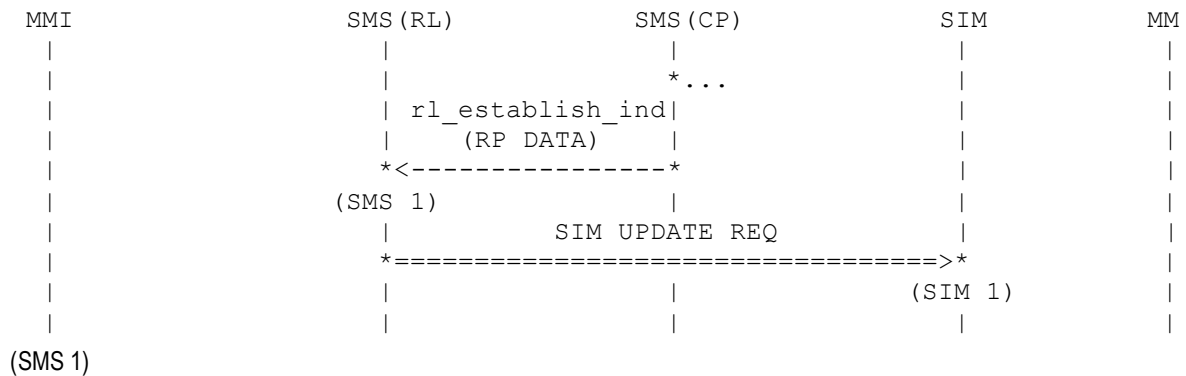
(SMS 2)

SMS indicates a write error during updating the record.

(SIM 2)

A memory capacity exceeded message will be send to the infrastructure to indicate that the SIM memory is not accessible. Therefore the message number in this mobile originated short message attempt is incremented.

No Storage on SIM available



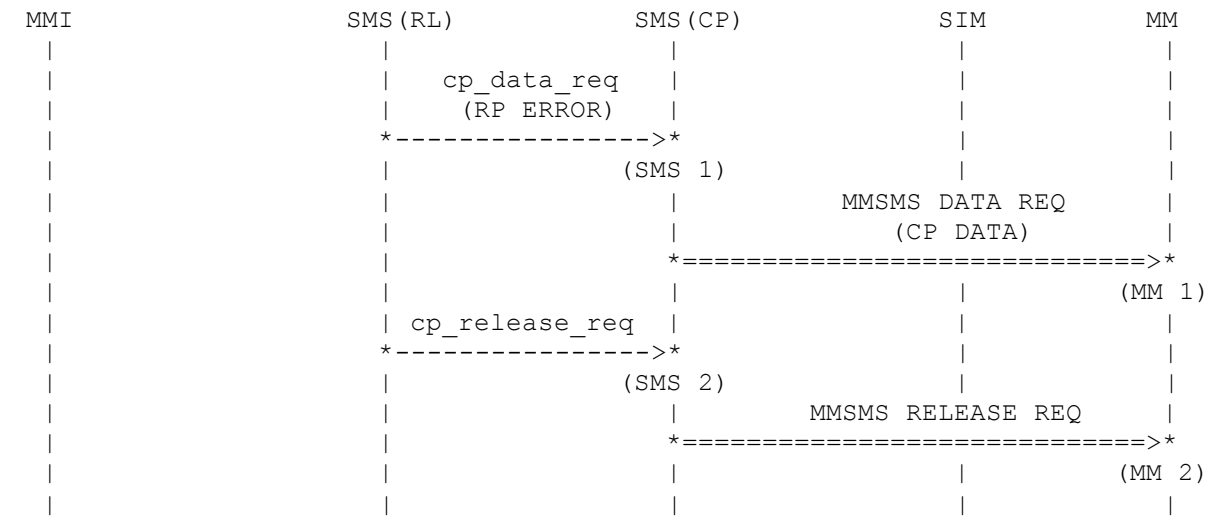
(SMS 1)

The incoming mobile terminated short message receives in the Relay Layer. Depending on the protocol identifier, the data coding scheme and the configured modes SMS decides that the message shall be stored in the SIM memory. Using the backup of SMS status bytes from the SIM card SMS finds no free entry.

(SIM 1)

A memory capacity exceeded message will be send to the infrastructure to indicate that the SIM memory is not accessible. Therefore the message number in this mobile originated short message attempt is incremented.

No Storage available on SIM memory, no other opportunities



(SMS 1)

The error, that no memory is available is coded in a RP ERROR message and forwarded to the CP layer.

(MM 1)

The RP ERROR message is filled in a CP DATA message and forwarded to the infrastructure.

(SMS 2)

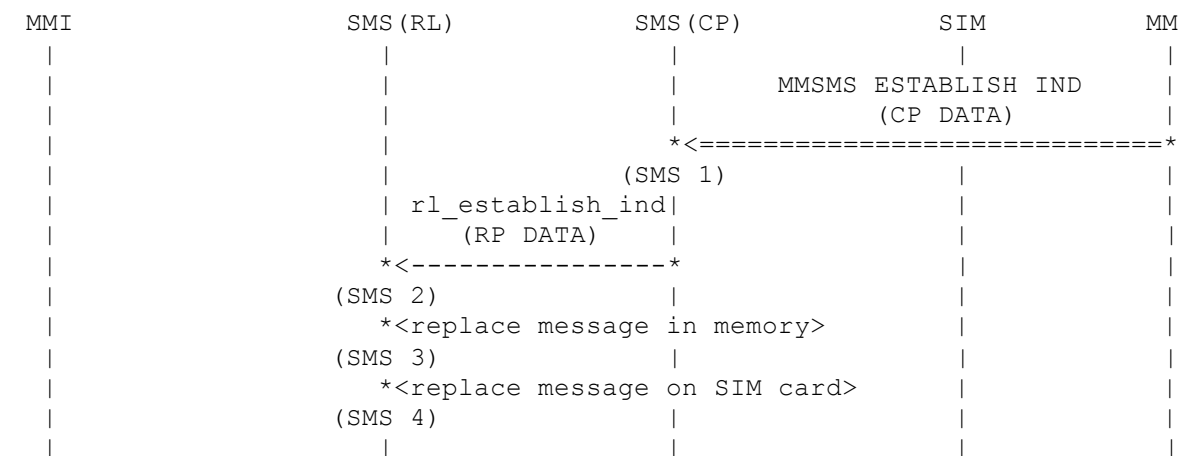
The RL layer will release the SMS connection.

(MM 2)

MM is informed about the release of the SMS connection.

Replace Short Message

Replace in Mobile Station Memory



(SMS 1)

MM indicates the reception of a mobile terminated short message.

(SMS 2)

The protocol identifier of the incoming short message indicates that it is a replace short message. That means it shall replace a short message that is already stored in the mobile station.

(SMS 3)

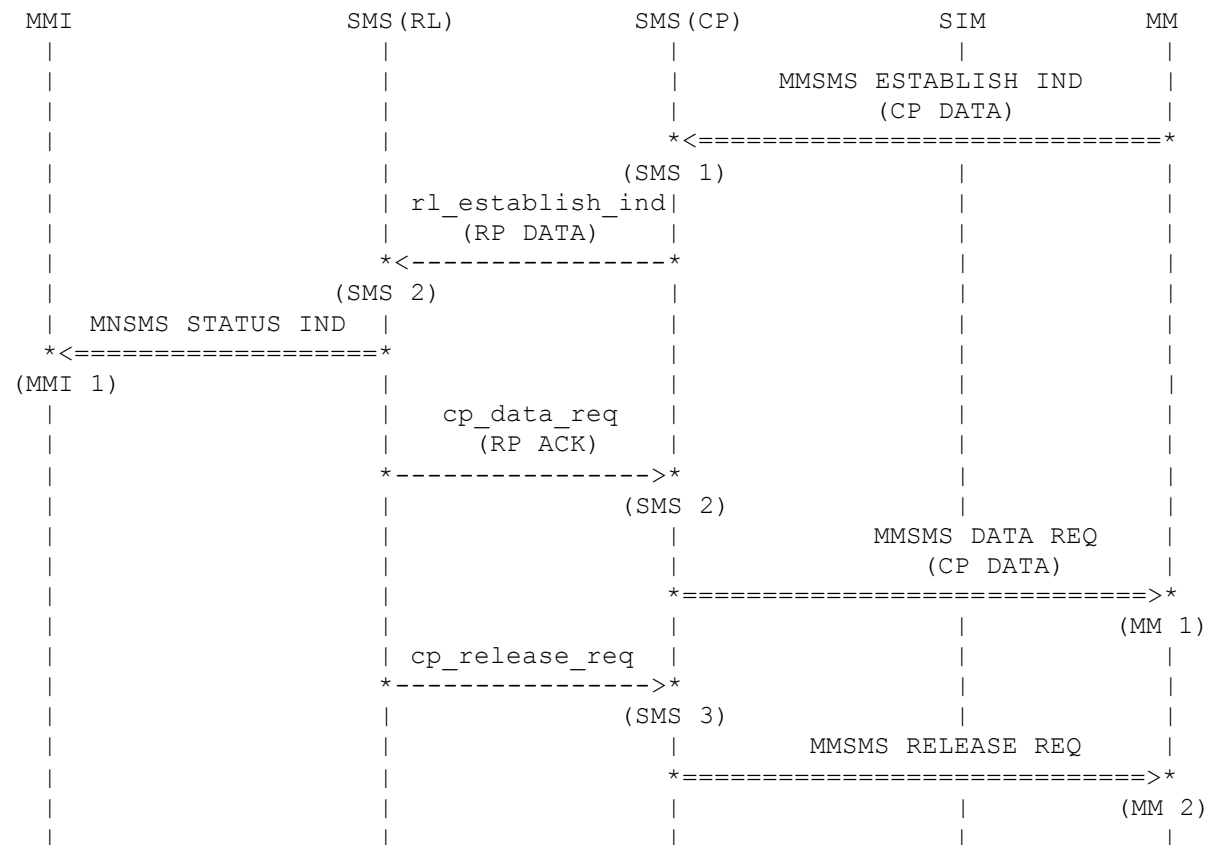
Using the ME backup of status and protocol identifier of all SMS messages in the ME memory a candidate is selected by SMS for replacing. This SMS message must be mobile terminated and must have the same protocol identifier. If such a SMS message is available, SMS reads the whole message from the permanent configuration memory and compares originator address and service centre address. If all matches the new message is stored in the mobile memory replacing the old one.

(SMS 4)

If replacing in the mobile memory has failed, the same is carried out for the SIM card memory. A pre-selection of candidates is carried out using the stored status and protocol identifier of the SMS messages stored on the SIM card. Then a possible record is read from the SIM card and the originator address and the service centre address are checked. If this parameter are also matching with the received message the SMS record on the SIM card is replaced.

If both checks are failed, normal storing of the incoming message is carried out.

Mobile Terminated Short Message Status



(SMS 1)

MM indicates the reception of a mobile terminated short message.

(SMS 2)

It is a SMS STATUS message.

(MMI 1)

The content of the SMS STATUS message is forwarded to MMI.

(SMS 2)

The reception of the RP DATA message is acknowledged by the RP ACK message.

(MM 1)

The message is forwarded to the infrastructure.

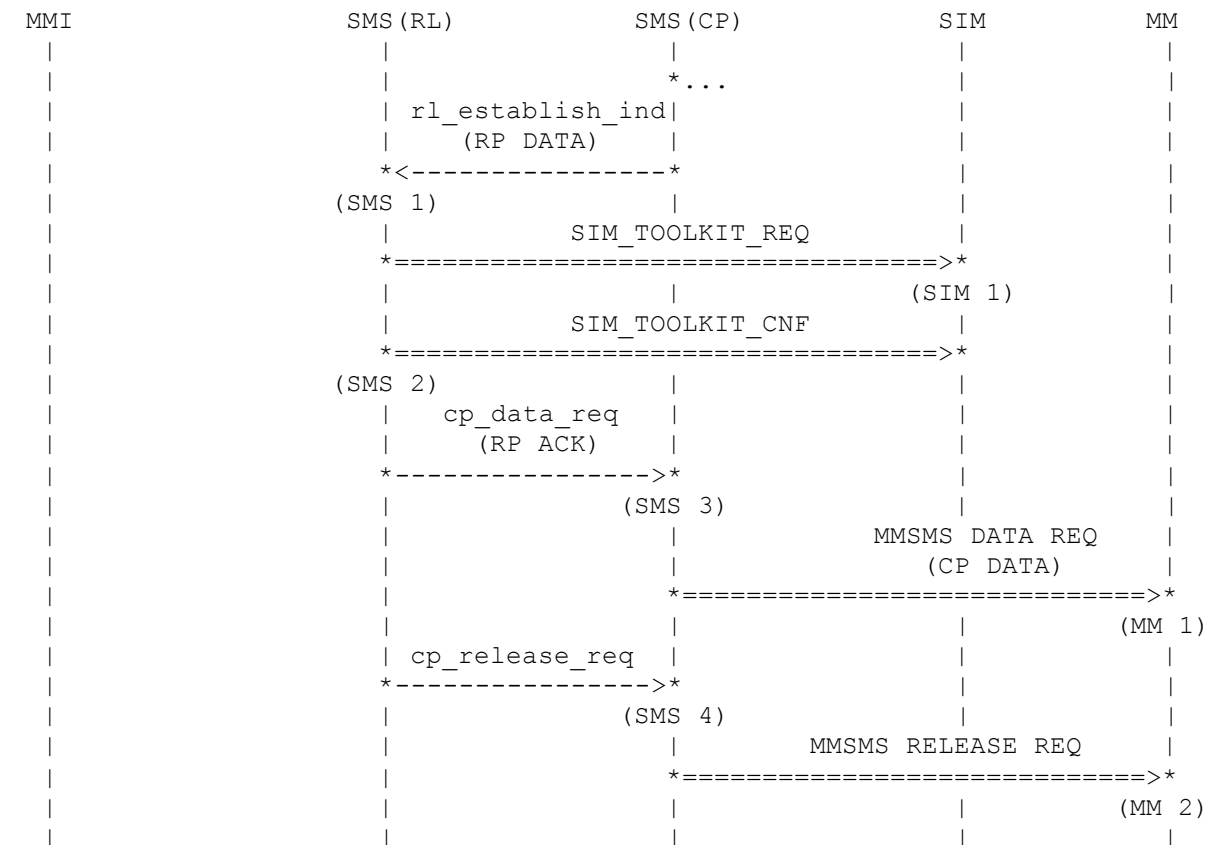
(SMS 3)

The RL layer releases the SMS connection.

(MM 2)

MM is informed about the release of SMS connection.

SIM Toolkit Data Download



(SMS 1)

The incoming mobile terminated short message receives in the Relay Layer. The protocol identifier indicates SIM Data Download.

(SIM 1)

If the sms download flag indicates support of this feature, the message content is forwarded to the SIM application.

(SMS 2)

The SIM application response receives.

(SMS 3)

Relay Layer builds a RP ACK message that may contain response data from the SIM application and sent it to Control Protocol.

(MM 1)

The message is part of a CP DATA message that is build by Control Protocol. The message is sent to the infrastructure.

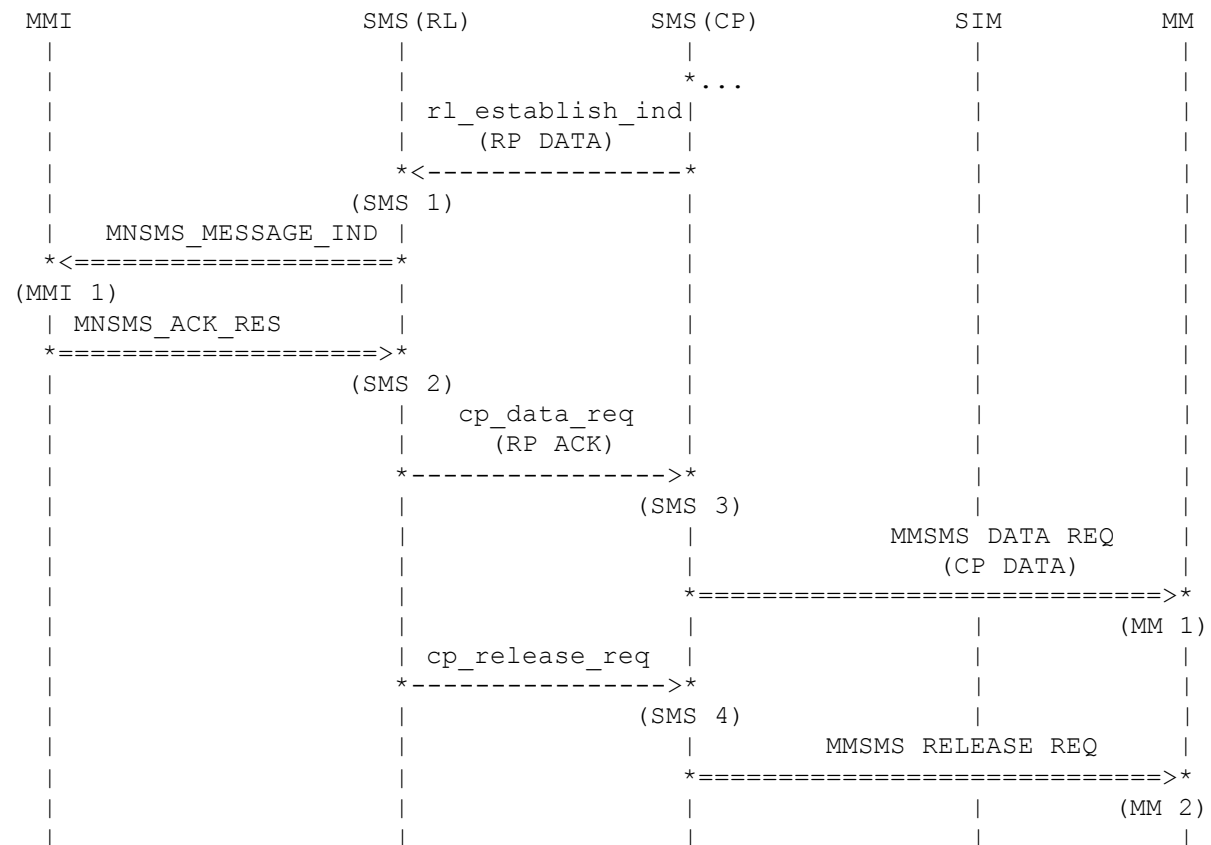
(SMS 4)

The Relay Layer will release the SMS connection.

(MM 2)

The release of SMS connection is forwarded to MM.

SMS - Depersonalisation



(SMS 1)

The incoming mobile terminated short message receives in the Relay Layer. The protocol identifier indicates SMS Depersonalisation.

(MMI 1)

The SMS message is forwarded to MMI.

(SMS 2)

MMI sends the response to SMS.

(SMS 3)

Relay Layer builds a RP ACK message containing the DELIVER REPORT from MMI and sent it to Control Protocol.

(MM 1)

The message is part of a CP DATA message that is build by Control Protocol. The message is sent to the infrastructure.

(SMS 4)

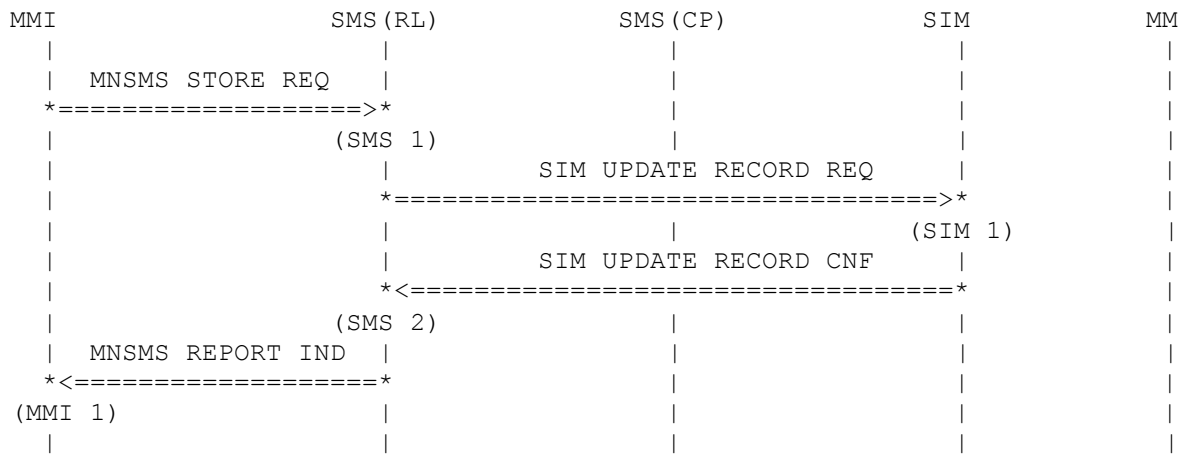
The Relay Layer will release the SMS connection.

(MM 2)

The release of SMS connection is forwarded to MM.

Short Message Service Procedures

Storing of Short Messages



(SMS 1)

MMI will store a mobile originated short message.

(SIM 1)

The memory type indicates storing on the SIM card. Therefore the SMS record on the SIM card is updated. If the memory type indicates storing in the mobile memory, the SMS message is stored in the mobile memory.

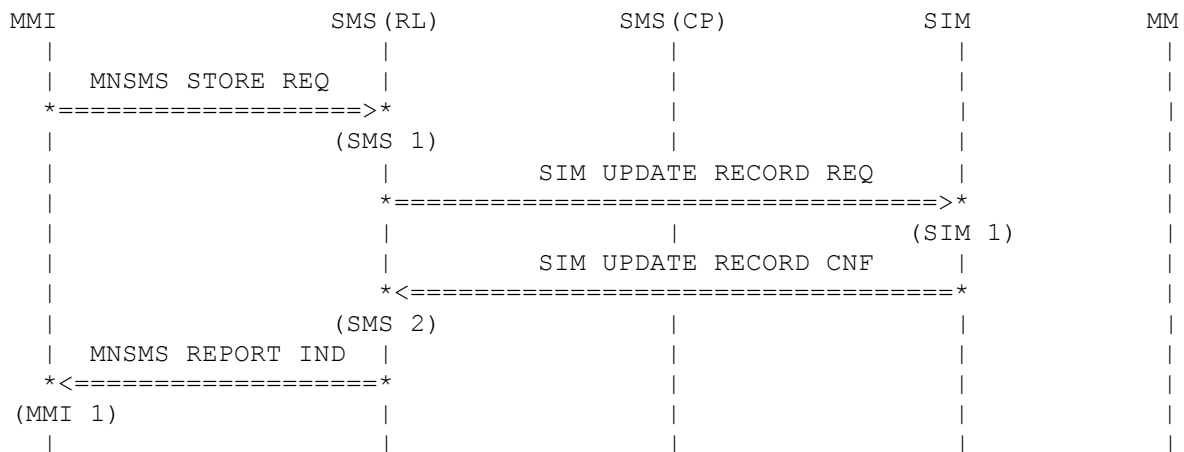
(SMS 2)

The SIM application indicates the successful operation of updating a SMS record.

(MMI 1)

An indication about the result of the operation is forwarded to the MMI.

Changing of Short Messages



(SMS 1)

MMI will change a short message. Therefore it has read the short message before.

(SIM 1)

The memory type indicates storing on the SIM card. Therefore the SMS record on the SIM card is updated. If the memory type indicates storing in the mobile memory, the SMS message is stored in the mobile memory.

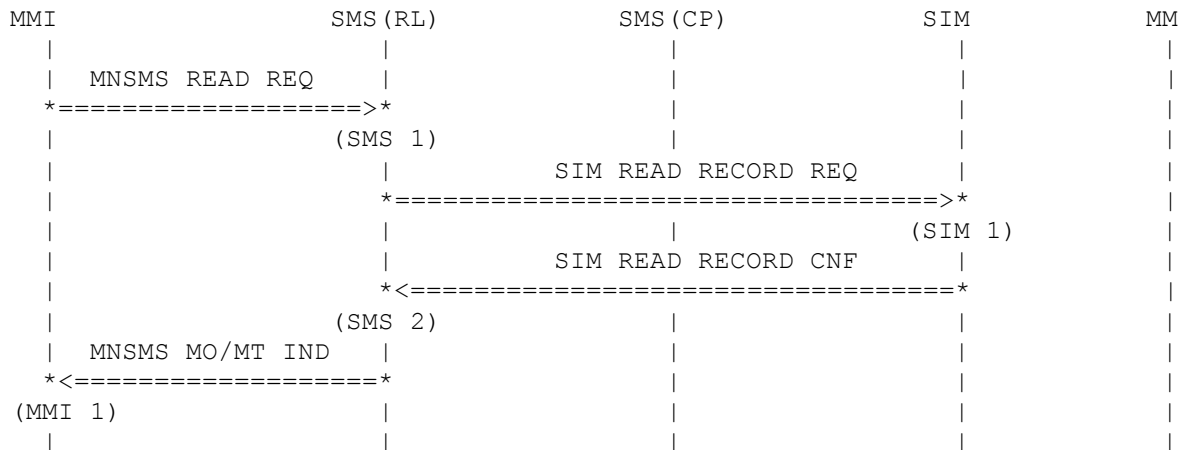
(SMS 2)

The SIM application indicates the successful operation of updating a SMS record.

(MMI 1)

An indication about the result of the operation is forwarded to the MMI.

Reading of Short Messages



(SMS 1)

MMI will read a short message.

(SIM 1)

If the memory type indicates reading from the SIM card, reading of a SMS record is requested from the SIM card. If the memory type mobile memory is selected SMS reads the record from the permanent configuration memory.

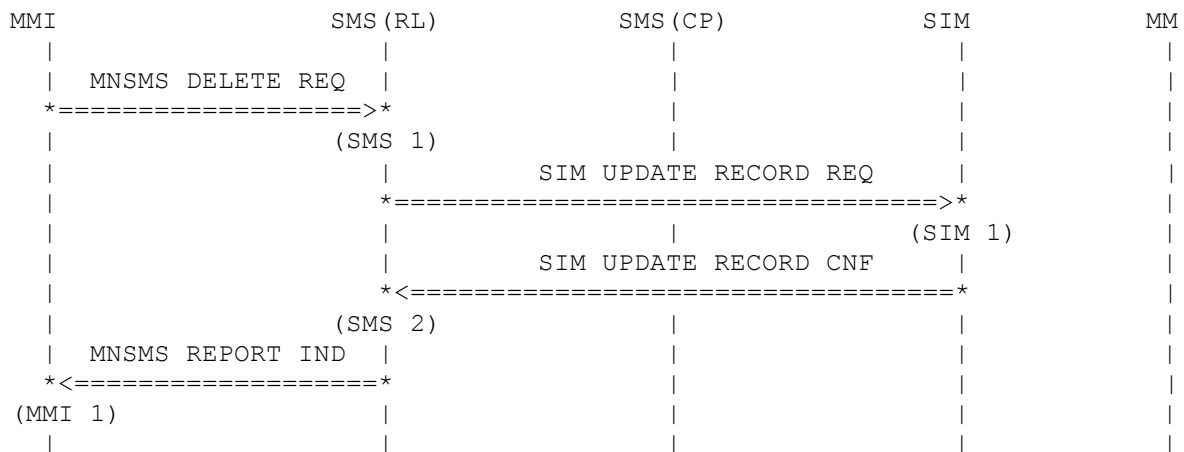
(SMS 2)

The SIM application returns the content of the record.

(MMI 1)

The mobile originated or terminated short message is forwarded to the MMI.

Deleting of Short Messages



(SMS 1)

MMI will delete a short message. Therefore it has read the short message before.

(SIM 1)

If the memory type indicates SIM card memory, the SIM application is requested to updated the content of the actual record, that means to write a free record content to this record. If mobile memory is selected, the message is stored directly and the response is given as described at (MMI 1).

(SMS 2)

The SIM application indicates the successful operation.

(MMI 1)

An indication about the result of the operation is forwarded to the MMI.

Data Formats

Mobile Terminated Short Message (Air-Interface)

Information Element Identifier	Message Structure		Example
	Transaction Identifier	Protocol Discriminator	
	Message Type		
CP-User Data	Length User Data		
RP-Data	0	mti	01
Message Reference	Message Reference		
RP-Originator Address	Length Originator Address		04
	Ton & Npi		81
	Digits		21
			43
			F5
RP-Destination Address	Not used		00
RP-User Data	Length RP User Data		
RP-Data	Flags	mti	
TP-Originator Address	Length TP-Originator Address		04
	Ton & Npi		81
	Digits		89
			67
			45
Protocol Identifier	Protocol Identifier		40
Data Coding Scheme	Data Coding Scheme		F0
Service Centre Time Stamp	Service Centre Time Stamp		89
			10
			70
			21
			43
			65
			04
TP-User Data	Length TP-User Data		08
			41
			E1
			90
			58
			34
			1E
			91
			49

Mobile Terminated Short Message (SIM)

Information Element Identifier	Message Structure	Example
SMS Status	status	
Service Centre Address	Length Service Centre Address	04
	Ton & Npi	81
	Digits	21
		43
		65
TP-Message Type	Flags Mti	
TP- Originator Address	Length TP-Originator Address	04
	Ton & Npi	81
	Digits	56
		31
		21
Protocol Identifier	Protocol Identifier	40
Data Coding Scheme	Data Coding Scheme	F0
Service Centre Time Stamp	Service Centre Time Stamp	89
		10
		70
		21
		43
		65
		04
TP-User Data	Length TP-User Data	06
		41
		E1
		90
		58
		34
		02

Mobile Originated Short Message (Air-Interface)

Information Element Identifier	Message Structure		Example
	Transaction Identifier	Protocol Discriminator	
	Message Type		
CP-User Data	Length User Data		
RP-Data	0	mti	00
Message Reference	Message Reference		
RP-Originator Address	Not used		00
RP-Destination Address	Length Destination Address		04
	Ton & Npi		81
	Digits		21
			43
			65
RP-User Data	Length RP User Data		
RP-Data	Flags	Mti	
TP-Message Reference	Message Reference		
TP-Destination Address	Length TP-Destination Address		04
	Ton & Npi		81
	Digits		56
			31
			21
Protocol Identifier	Protocol Identifier		40
Data Coding Scheme	Data Coding Scheme		F0
Validity Period	Validity Period		89
			10
			70
			21
			43
			65
			04
TP-User Data	Length TP-User Data		06
			41
			E1
			90
			58
			34
			02

Mobile Originated Short Message (SIM)

Information Element Identifier	Message Structure	Example
SMS Status	status	
Service Centre Address	Length Service Centre Address	04
	Ton & Npi	81
	Digits	21
		43
		65
TP-Message Type	Flags Mti	
TP-Message Reference	Message Reference	
TP- Destination Address	Length TP- Destination Address	04
	Ton & Npi	81
	Digits	56
		31
		21
Protocol Identifier	Protocol Identifier	40
Data Coding Scheme	Data Coding Scheme	F0
Validity Period	Validity Period	89
		10
		70
		21
		43
		65
		04
TP-User Data	Length TP- User Data	06
		41
		E1
		90
		58
		34
		02

Appendices

A. Acronyms

DS-WCDMA Direct Sequence/Spread Wideband Code Division Multiple Access

B. Glossary

International Mobile Telecommunication 2000 (IMT-2000/ITU-2000) Formerly referred to as FPLMTS (Future Public Land-Mobile Telephone System), this is the ITU's specification/family of standards for 3G. This initiative provides a global infrastructure through both satellite and terrestrial systems, for fixed and mobile phone users. The family of standards is a framework comprising a mix/blend of systems providing global roaming. <URL: <http://www.imt-2000.org/>>