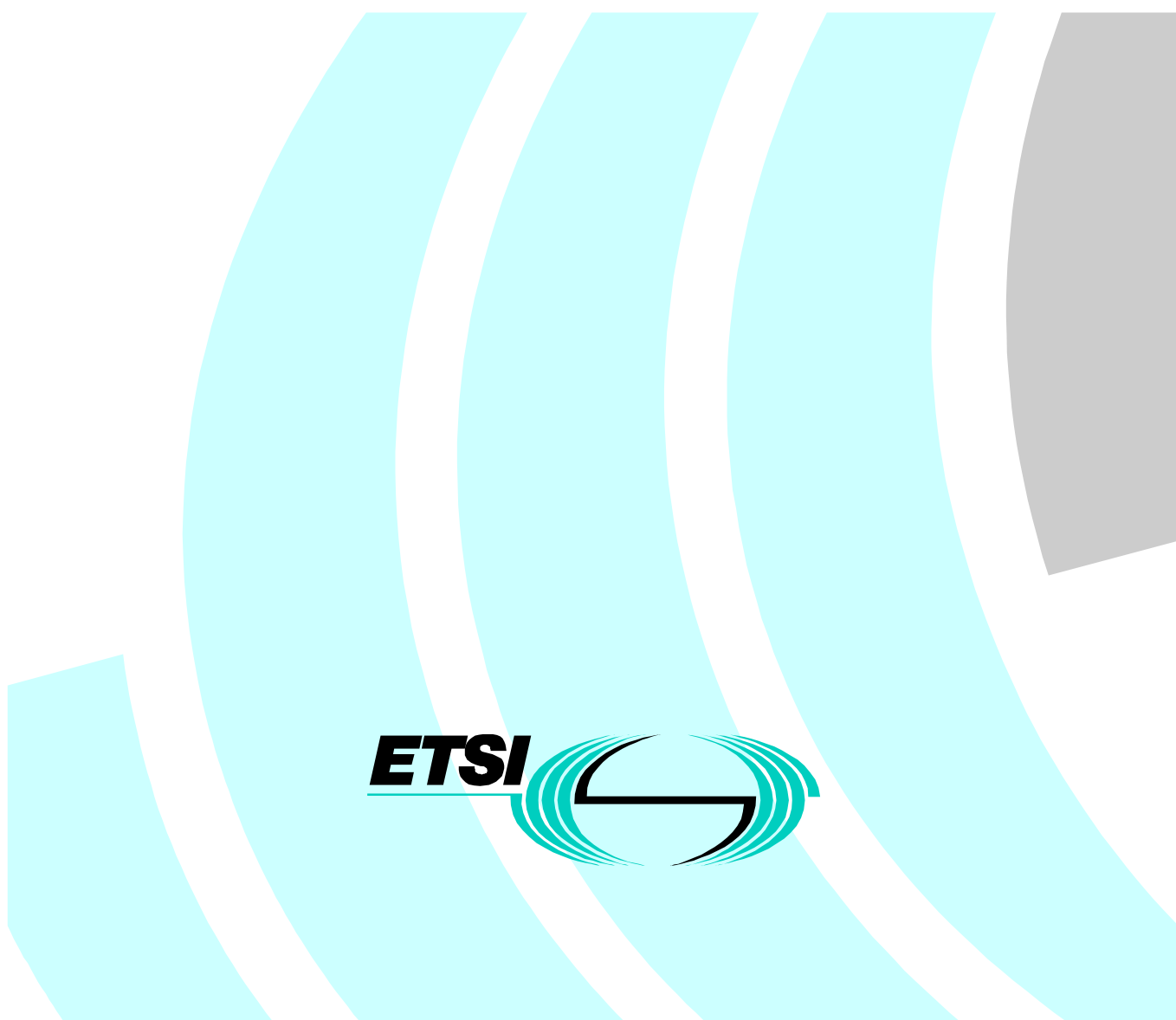


Universal Short Message Service (uSMS); IN architecture and functionality



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Keywords

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Foreword

This ETSI Guide (EG) has been produced by ETSI Technical Committee Services and Protocols for Advanced Networks (SPAN).

1 Scope

The present document gives guidance on the network architecture and functionality to support a Point-Point Short Message Service (PP-SMS) feature to users access network services via PSTN, ISDN, PLMN and IP as it is defined in DES/SPAN-110093 (see Bibliography).

2 References

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

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

- [1] GSM 09.02: "European digital telecommunications system; Mobile Application Part (MAP) specification".
 - [2] GSM 03.40: "Technical realization of the Short Message Service (SMS) Point-to-Point (PP)".
 - [3] CCITT Recommendation E.213: "Telephone and ISDN numbering plan for land mobile stations in public land mobile networks (PLMN)".
 - [4] ITU-T Recommendation E.164: "The international public telecommunication numbering plan".
-

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in GSM 09.02 [1] apply.

msIsdn: this parameter refers to one of the ISDN numbers assigned to a mobile subscriber in accordance with CCITT Recommendation E.213 [3]

sm-RP-PRI: this parameter is used to indicate whether or not delivery of the short message shall be attempted when a service centre address is already contained in the Message Waiting Data file

ServiceCentreAddress: this parameter represents the address of a Short Message Service Centre

Sm-RP-UI: this parameter represents the user data field carried by the short message service relay sub-layer protocol

MoreMessagesToSend: this parameter is used to indicate whether or not the service centre has more short messages to send

MwStatus: this parameter indicates whether or not the address of the originator service centre is already contained in the Message Waiting Data file. In addition, it contains the status of the Memory Capacity Exceeded Flag (MCEF) and the status of the Mobile subscriber Not Reachable Flag (MNRF)

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

CLI	Calling Line Identity
CUSF	Call Unrelated Service Function
FT	Fixed Terminal
GSM	Global System for Mobile communication
HLR	Home Location Register
INAP	Intelligent Network Application Protocol
IWF	InterWorking Function
IWU	InterWorking Unit
MAP	Mobile Application Protocol
MCEF	Mobile Station Memory Capacity Exceeded Flag
MNRF	Mobile Not Reachable Flag
MWD	Message Waiting Data
PT	Portable Terminal
SC	Service Control
SCF	Service Control Function
SCFh	SCF home (network)
SCFv	SCF visited (network)
SCUAF	Service Call Unrelated Agent Function
SDF	Service Data Function
SMS	Short Message Service
SMSC	Short Message Service Centre
VLR	Visited Location Register

4 uSMS service requirements

The uSMS service requirements are specified in DES/SPAN-110093 (see Bibliography).

In line with the HLR in GSM networks, the supporting network shall have some predefined data fields for uSMS parameters. For example,

The HLR contains (optional):

- Message Waiting Data (MWD):
 - MSIsdn-Alert;
 - SC address 1;
 - SC address 2;
 - ...;
 - SC address n;
- Mobile Not Reachable Flag (MNRF);
- Mobile Station Memory Capacity Exceeded Flag (MCEF).

The VLR contains (optional):

- Mobile Not Reachable Flag (MNRF).

The case where MWD, MNRF and MCEF are not implemented in the HLR is also described in GSM 03.40 [2].

5 uSMS Functional Architecture

5.1 ISDN/IN Infrastructure

This section describes the architecture for uSMS based on an ISDN/IN supporting infrastructure. It covers these cases where the user is in his/her home network or in a visited network. The implementation of uSMS should deliver the SMS with the same (or higher) QoS as for the GSM SMS.

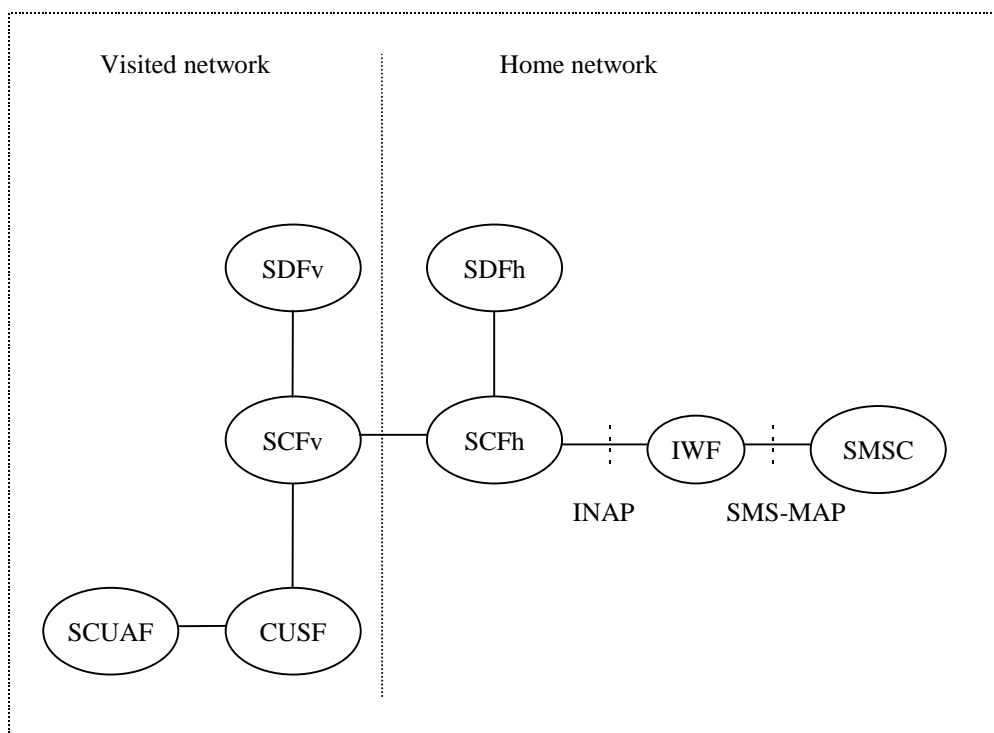


Figure 1: Architecture for uSMS in ISDN/IN

5.2 Packet Service Infrastructure

This is for further study.

6 Point-Point uSMS Procedures and Information Flows

This section displays for each procedure information flows; the mapping of these flows to specific protocol messages is outside the scope of the present document.

The following procedures are relevant for the uSMS service:

- Short Message terminal originated (normal and exception procedure);
- Short Message terminal terminated (normal and exception procedure);
- Short Message delivery notification.

NOTE: In the present document the SMS is defined following the GSM procedures (i. e. it is assumed that the terminals are able to store SMS messages).

6.1 Terminal originated uSMS normal transfer procedure

In the terminal originated case, a short message is sent from the terminal (portable or fixed) towards the short message service centre. This short message is sent along with the E.164 [4] number of the recipient, and possibly the Calling Line Identity of the originating terminal (CLI) in case the recipient should receive this information as in the GSM SMS service. The CLI may be replaced by the calling user number e.g. in the case of virtual calling card, UPT.

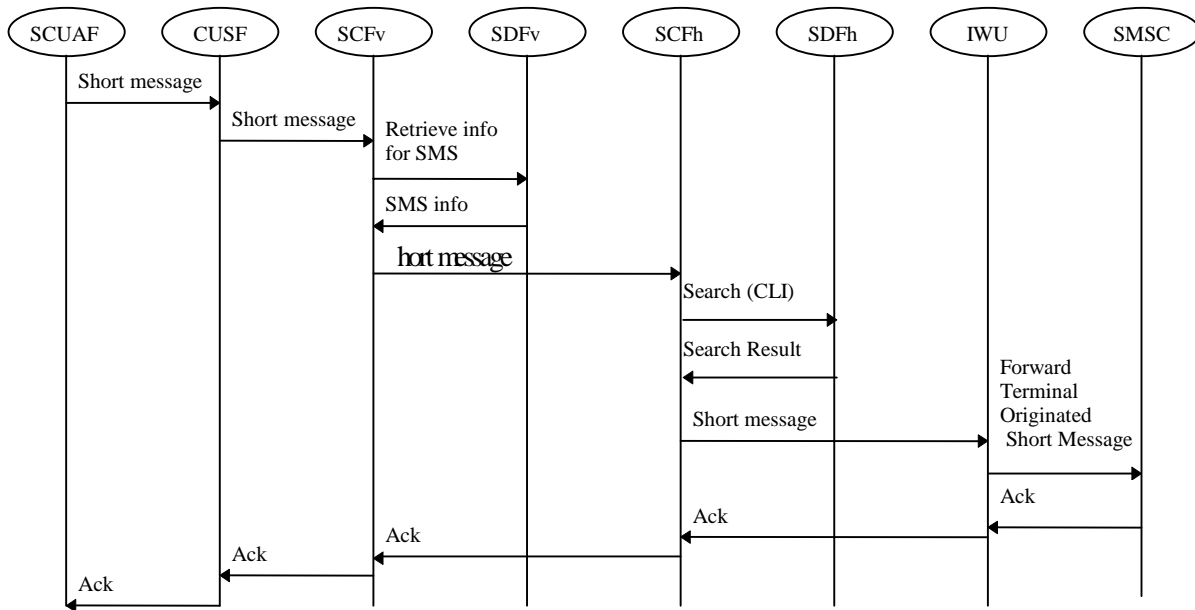


Figure 2: Terminal originated short message transfer

Information flow	Interface	Parameters needed
Short message	SCUAF-CUSF	<ul style="list-style-type: none"> Called Party E.164 [4] Calling Party E.164 [4] (CLI) ServiceCentreAddress sm-RP-UI
Short message	CUSF-SCFv	<ul style="list-style-type: none"> Called Party E.164 [4] Calling Party E.164 [4] (CLI) ServiceCentreAddress sm-RP-UI
Retrieve info for SMS	SCFv-SDFv	<ul style="list-style-type: none"> CLI
SMS info	SDFv-SCFv	<ul style="list-style-type: none"> SCFh id (Note 2)
Short message	SCFv-SCFh	<ul style="list-style-type: none"> Called Party E.164 [4] Calling Party E.164 [4] (CLI) ServiceCentreAddress sm-RP-UI
Search	SCFh-SDFh	<ul style="list-style-type: none"> CLI (Note 1)
Search Result	SDFh-SCFh	<ul style="list-style-type: none"> Ack (ServiceCentreAddress)
Short message	SCFh-IWU	<ul style="list-style-type: none"> Called Party E.164 [4] Calling Party E.164 [4] (CLI) ServiceCentreAddress sm-RP-UI
ForwardMOShortMessage	IWU-SMSC	<ul style="list-style-type: none"> Called Party E.164 [4] Calling Party E.164 [4] (CLI) ServiceCentreAddress (optional) sm-RP-UI

NOTE 1: In order to retrieve and check the SMS access rights of the user, when the user originates a uSMS procedure, the SCFh queries the SDFh.

NOTE 2: Another possibility could be to use serviceCentreAddress, and forward the short message directly to the IWU, and bypass the SCFsl.

6.2 Terminal terminated uSMS normal transfer procedure

In the terminal terminated case, a short message is sent from the short message service centre towards the user. Also the ServiceCentreAddress is included in the transfer. The moreMessagesToSend information element allows for concatenation of SMS messages.

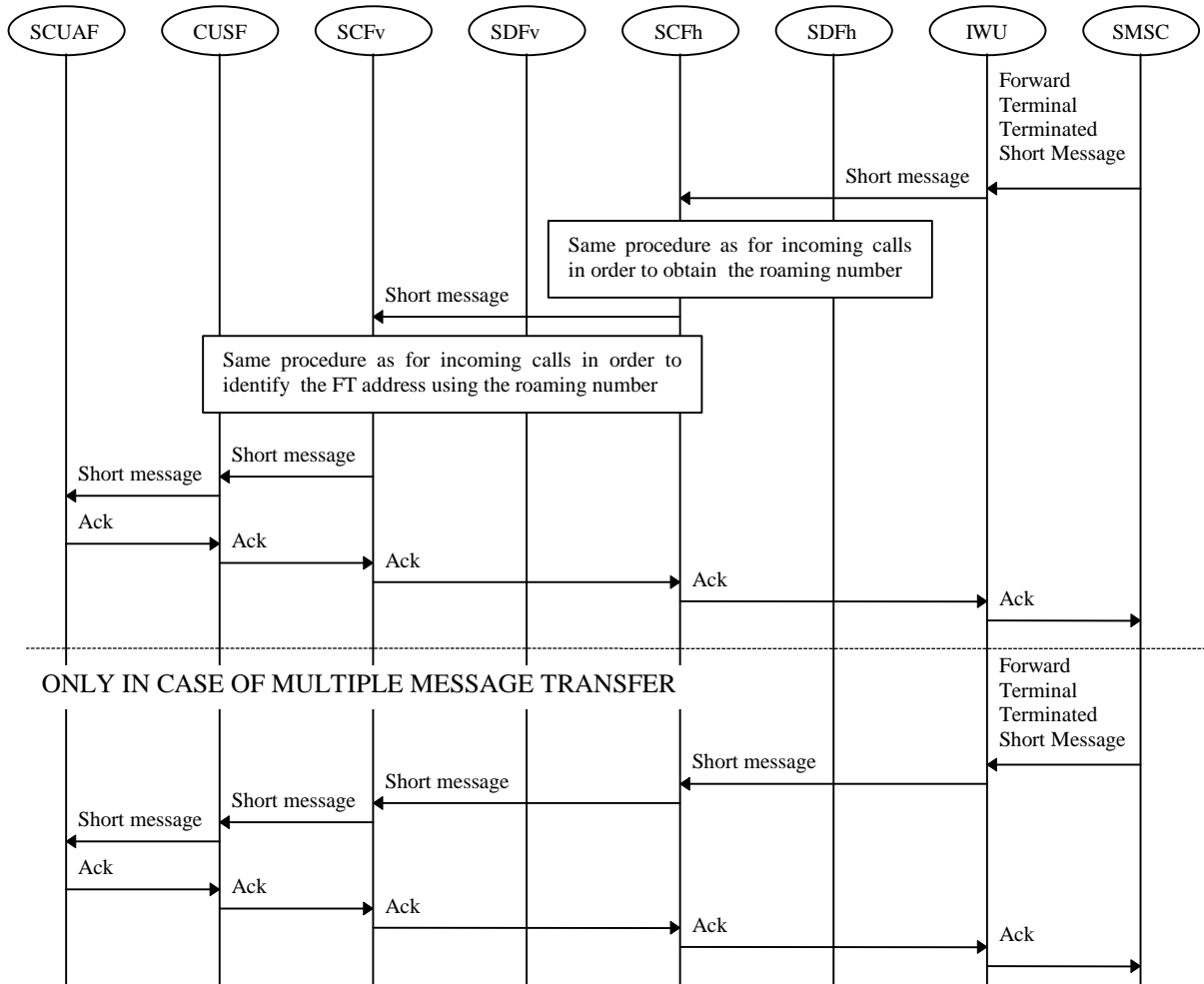


Figure 3: Terminal terminated uSMS procedure - single and multiple short message transfer

Information flow	Interface	Parameters needed
ForwardMTShortMessage	SMSC-IWU	<ul style="list-style-type: none"> msIsdn=Called Party E.164 [4] sm-RP-PRI ServiceCentreAddress sm-RP-UI moreMessagesToSend
Short message	IWU-SCFh	<ul style="list-style-type: none"> Called Party E.164 [4] sm-RP-PRI ServiceCentreAddress sm-RP-UI moreMessagesToSend
Short message	SCFv-SCFv	<ul style="list-style-type: none"> Called Party and/or roaming number (E.164 [4]) ServiceCentreAddress sm-RP-UI moreMessagesToSend
Short message	SCFv-CUSF	<ul style="list-style-type: none"> Called Party and/or roaming number (E.164 [4]) ServiceCentreAddress sm-RP-UI moreMessagesToSend
Short message	CUSF-SCUAF	<ul style="list-style-type: none"> Called Party and/or roaming number (E.164 [4]) ServiceCentreAddress sm-RP-UI moreMessagesToSend

6.3 Terminal originated uSMS exception transfer procedure

The following information flows are for terminal originated messages.

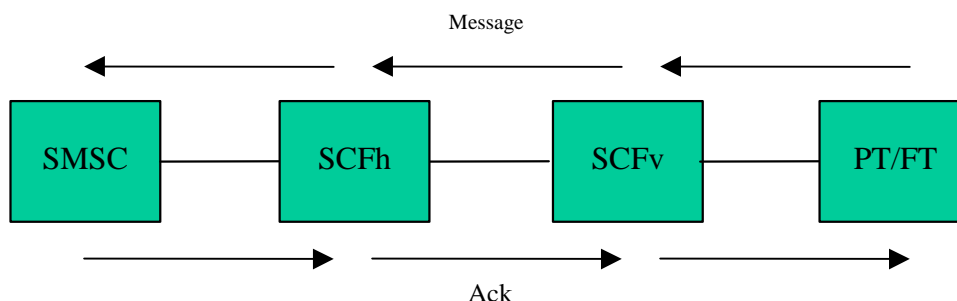


Figure 4: Generic flows for terminal originated Message

For 'normal' operation, the short message sent by the terminal is received by the SMSC and is checked for data accuracy. If correct, then an acknowledgement is sent by the SMSC to the terminal to confirm receipt of the message.

Error handling procedures may happen in case of:

- **Defective transmission between the terminal and the message centre:**

The SMSC receives the short message but detects that it is corrupted. The SMSC then reports the message failure to the originating terminal. The terminal then informs the user of the message sending failure. The User would then have to resend the message.

- **Loss of transmission between the terminal and the message centre:**

In this case, the SMSC does not receive any message (or insufficient to diagnose the sender) and is therefore unable to acknowledge the originating terminal of the transmission failure. Expiring of a local timer in the terminal would initiate a message to the user to inform that a message failure has occurred. The User would then have to resend the message.

- **Defective transmission between the message centre and the terminal:**

The SMSC transmits the acknowledgement on receipt of the short message. The originating terminal detects that the acknowledgement is corrupted and informs the user of the message sending failure. The User would then have to resend the message.

- **Loss of transmission between the message centre and the terminal:**

As far as the user is concerned, this case is identical to the case described for Loss of transmission between the terminal and the message centre. However, the SMSC has received a correct short message which it would then deliver. If the User then resends the message, a duplicate message will be received by the SMSC and subsequently processed.

6.4 Terminal terminated uSMS exception transfer procedure

6.4.1 Exception handling transfer procedure

The following information flows are for terminal terminated messages.

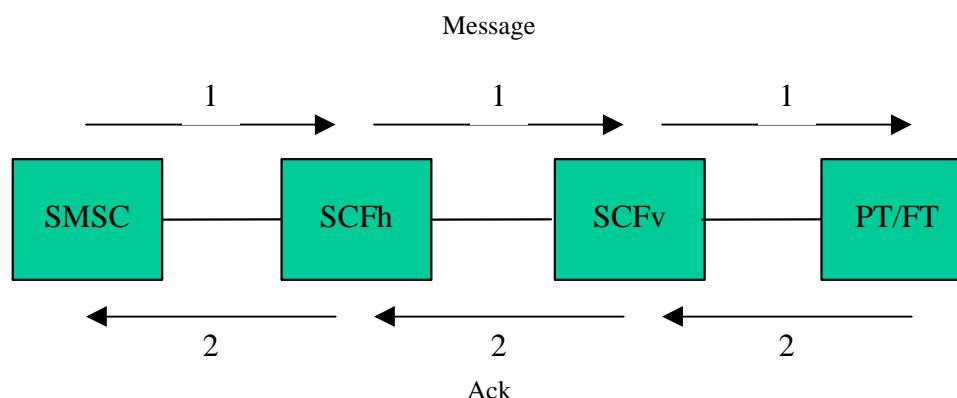


Figure 5: Generic flows for terminal terminated Message

For 'normal' operation, the short message sent by the SMSC is received by the terminal and is checked for data accuracy. If correct, then an acknowledgement is sent by the terminal to the SMSC to confirm receipt of the message.

Error handling procedures may happen in case of:

- **Defective transmission between the message centre and the terminal:**

The terminal receives the short message but detects that it is corrupted. The terminal then reports the message failure to the SMSC. The SMSC would then have to resend the message.

- **Loss of transmission between the message centre and the terminal:**

In this case, the terminal does not receive any message and is therefore unable to inform the SMSC of the transmission failure. After expiry of a timer in the SMSC, the SMSC would then have to resend the message.

- **Defective transmission between the terminal and the message centre:**

The terminal transmits the acknowledgement on receipt of the short message. The SMSC detects that the acknowledgement is corrupted and the SMSC would then resend the message. The terminating terminal would receive a duplicate short message.

- **Loss of transmission between the terminal and the message centre:**

As far as the user is concerned, this case is identical to the case described for Loss of transmission between the SMSC and the terminal. However, the terminal has received a correct short message. The SMSC would then resend the message and the terminating terminal would receive a duplicate short message.

6.4.2 Exception handling terminal not reachable

6.4.2.1 Terminal terminated uSMS transfer attempt on terminal not reachable

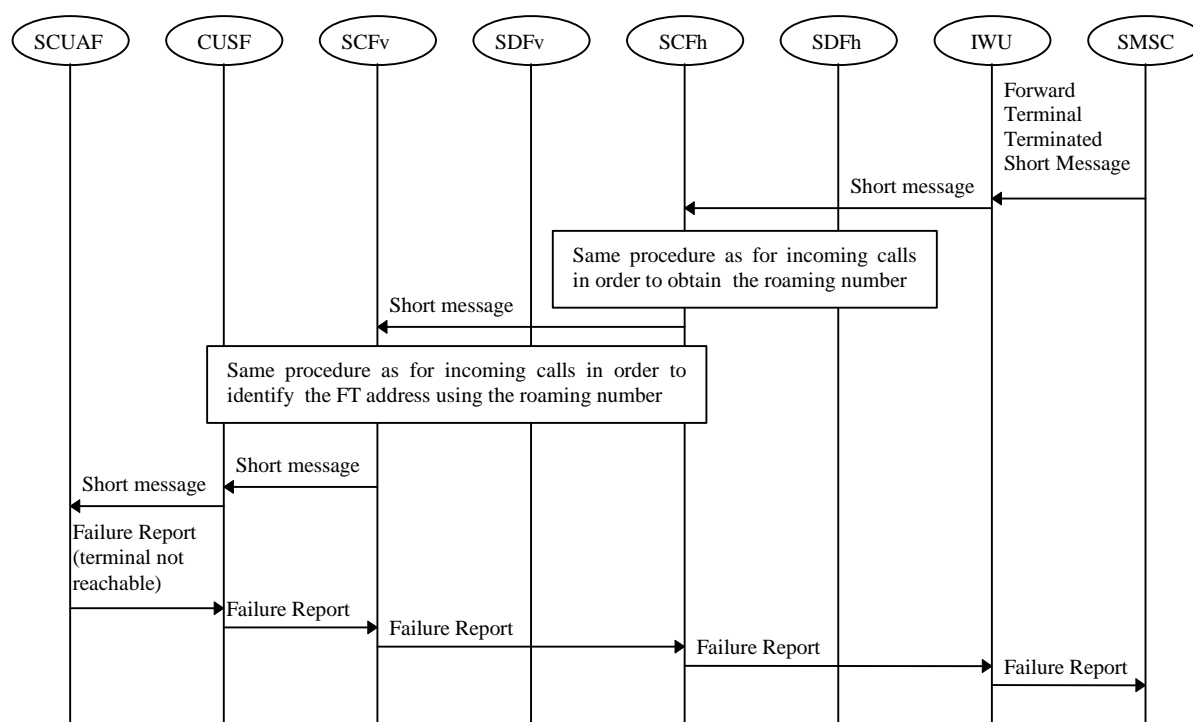


Figure 6: Terminal terminated uSMS transfer attempt on terminal not reachable

NOTE: This sequence is only valid for radio terminals where an explicit paging failure message could be returned.

Information flow	Interface	Parameters needed
ForwardMTShortMessage	SMSC-IWU	<ul style="list-style-type: none"> • msIsdn=Called Party E.164 [4] • sm-RP-PRI • ServiceCentreAddress • sm-RP-UI • moreMessagesToSend
Short message	IWU-SCFh	<ul style="list-style-type: none"> • Called Party E.164 [4] • sm-RP-PRI • ServiceCentreAddress • sm-RP-UI • moreMessagesToSend
Short message	SCFv-SCFv	<ul style="list-style-type: none"> • Called Party and/or roaming number (E.164 [4]) • ServiceCentreAddress • sm-RP-UI • moreMessagesToSend
Short message	SCFv-CUSF	<ul style="list-style-type: none"> • Called Party and/or roaming number (E.164 [4]) • ServiceCentreAddress • sm-RP-UI • moreMessagesToSend
Short message	CUSF-SCUAF	<ul style="list-style-type: none"> • Called Party and/or roaming number (E.164 [4]) • ServiceCentreAddress • sm-RP-UI • moreMessagesToSend

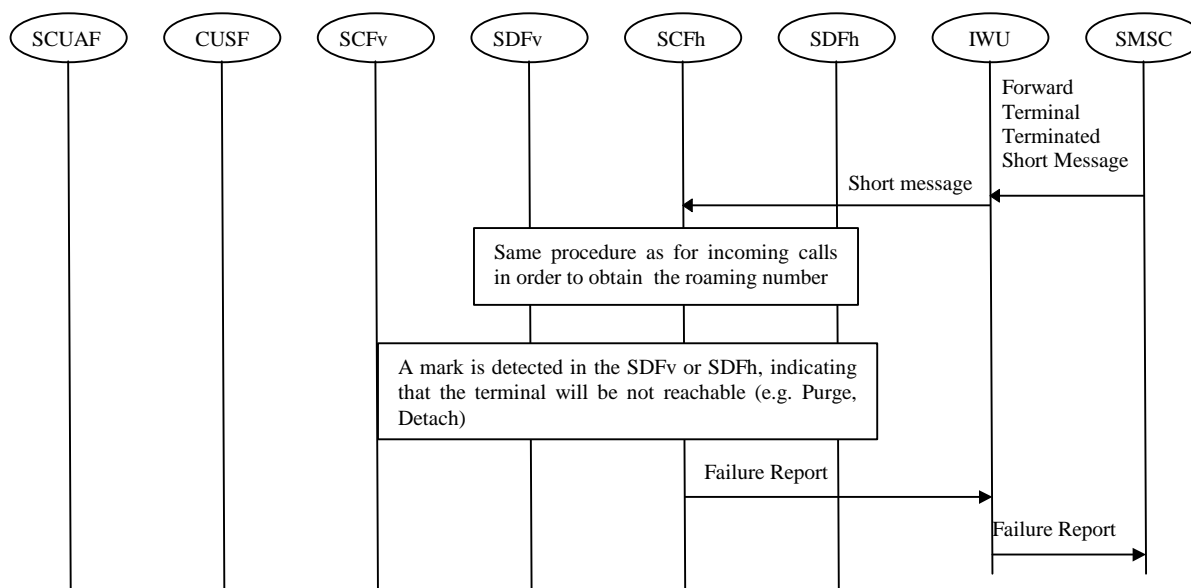


Figure 7: Terminal terminated uSMS transfer attempt failing due to negative outcome of SDFh or SDFv information retrieval

This may also be valid for terminal or personal mobility cases.

Information flow	Interface	Parameters needed
ForwardMTShortMessage	SMSC-IWU	<ul style="list-style-type: none"> • mslsdn=Called Party E.164 [4] • sm-RP-PRI • ServiceCentreAddress • sm-RP-UI • moreMessagesToSend
Short message	IWU-SCFh	<ul style="list-style-type: none"> • Called Party E.164 [4] • sm-RP-PRI • ServiceCentreAddress • sm-RP-UI • moreMessagesToSend

6.4.2.2 uSMS alert procedure initiated by the network (terminal is present)

The "alert" and "update subscriber info" is a result of a Location Registration Procedure, and will not be treated here. After a successful Location Registration Procedure, the service centres are notified that the terminal is attached to the network.

In the case of terminal mobility, the location registration procedure is used to load the mobile terminal over the air with certain identities, and to make the mobile terminal known to the network. The mobile terminal can use the data to gain access to the network and to make calls, and to recognize the system to receive calls. The network can use the information to validate service requests from the PT, and to route calls to valid PTs.

The same information may be applicable to personal mobility on fixed or mobile terminals for SMS origination and delivery.

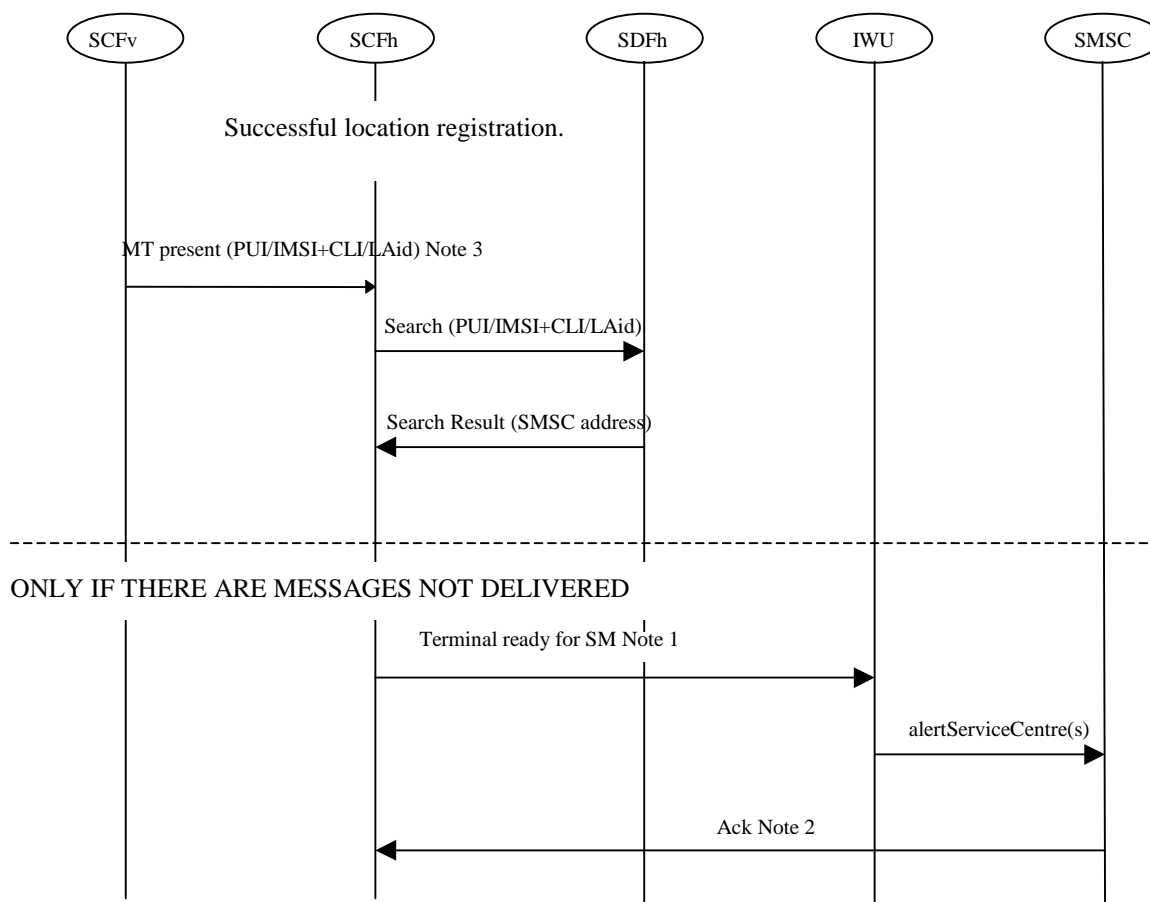


Figure 8: uSMS alert procedure (terminal is present)

Information flow	Interface	Parameters needed
MT present	SCFv-SCFh	<ul style="list-style-type: none"> PUI/IMSI+CLI/LAid
Search	SCFh-SDFh	<ul style="list-style-type: none"> PUI/IMSI+CLI/LAid
Search Result	SDFh-SCFh	<ul style="list-style-type: none"> PUI/IMSI+CLI/LAid ServiceCentreAddresses
Terminal ready for SM	SCFh-IWU	<ul style="list-style-type: none"> PUI/IMSI+CLI/LAid ServiceCentreAddress
alertServiceCentre	IWU-SMSC	<ul style="list-style-type: none"> Msisdn= PUI/IMSI+CLI/LAid ServiceCentreAddress

NOTE 1: In case of multiple SMSC, last two flows will be repeated as many times as the SMSC number.

NOTE 2: The information about some previous unsuccessful messages not delivered to the Mobile Terminal is available in the SDFh.

NOTE 3: The first flow is present only in case of alert procedure initiated by the SCFv.

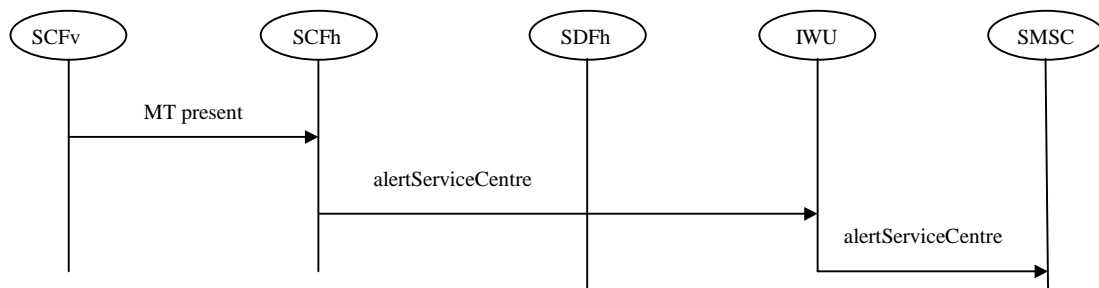


Figure 9: uSMS alert procedure when the terminal becomes reachable

Information flow	Interface	Parameters needed
NoteMSpresent	SCFv-SCFh	<ul style="list-style-type: none"> PUI/IMSI+CLI/LAid
Terminal ready for SM	SCFh-IWU	<ul style="list-style-type: none"> PUI/IMSI+CLI/LAid ServiceCentreAddress
alertServiceCentre	IWU-SMSC	<ul style="list-style-type: none"> Msisdn= PUI/IMSI+CLI/LAid ServiceCentreAddress

6.4.3 Exception handling memory not available

6.4.3.1 Terminal terminated uSMS transfer attempt on memory not available

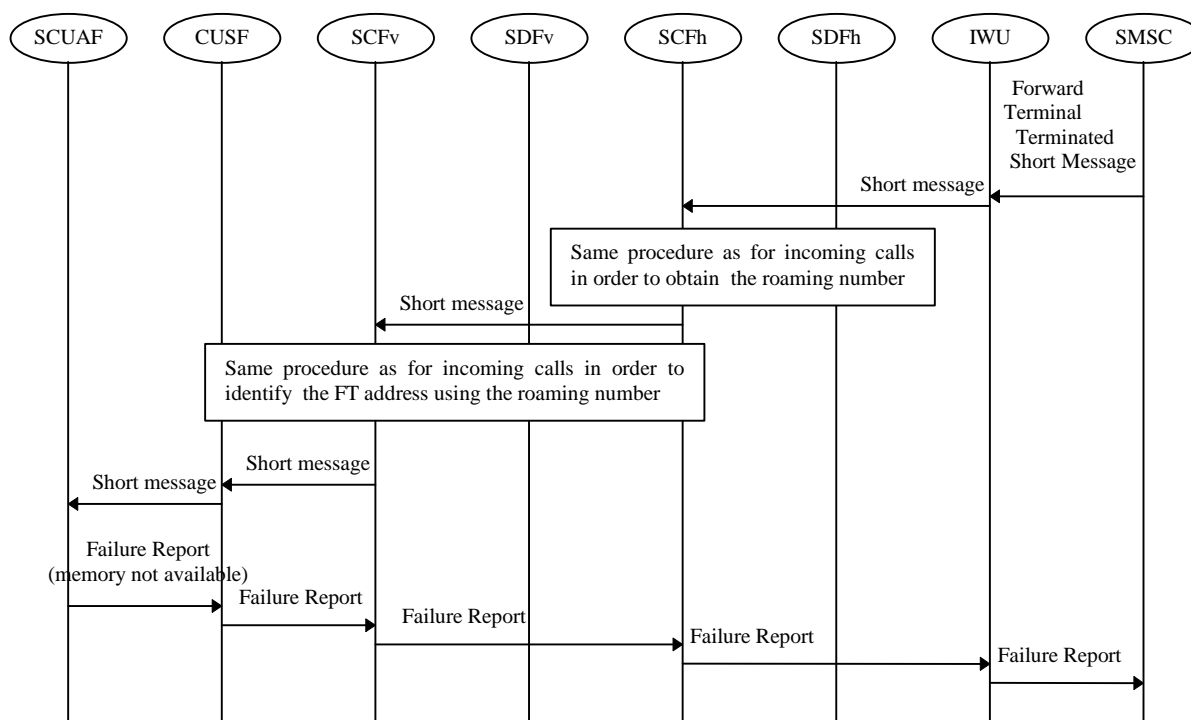


Figure 10: Terminal terminated uSMS transfer attempt on memory not available

Information flow	Interface	Parameters needed
ForwardMTShortMessage	SMSC-IWU	<ul style="list-style-type: none"> msIsdn=Called Party E.164 [4] sm-RP-PRI ServiceCentreAddress sm-RP-UI moreMessagesToSend
Short message	IWU-SCFh	<ul style="list-style-type: none"> Called Party E.164 [4] sm-RP-PRI ServiceCentreAddress sm-RP-UI moreMessagesToSend
Short message	SCFv-SCFv	<ul style="list-style-type: none"> Called Party and/or roaming number (E.164 [4]) ServiceCentreAddress sm-RP-UI moreMessagesToSend
Short message	SCFv-CUSF	<ul style="list-style-type: none"> Called Party and/or roaming number (E.164 [4]) ServiceCentreAddress sm-RP-UI moreMessagesToSend
Short message	CUSF-SCUAF	<ul style="list-style-type: none"> Called Party and/or roaming number (E.164 [4]) ServiceCentreAddress sm-RP-UI moreMessagesToSend

6.4.3.2 uSMS alert procedure initiated by the Terminal (memory available)

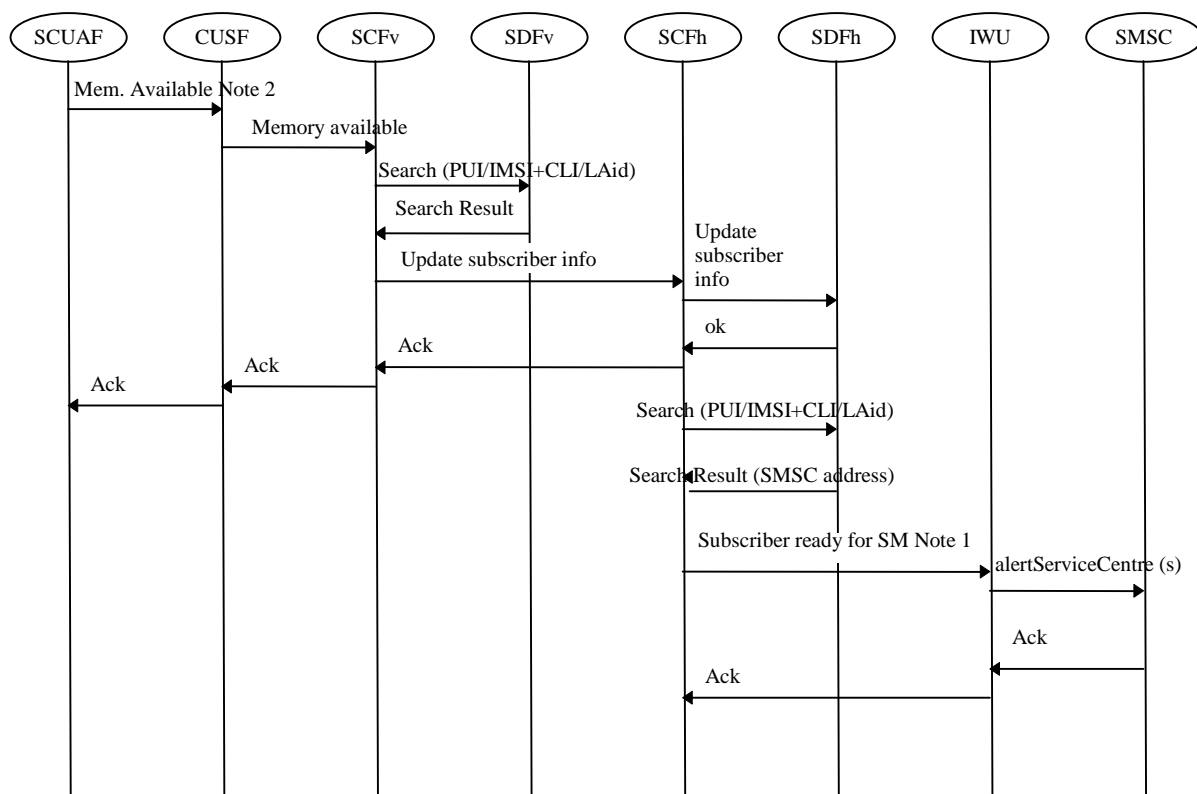


Figure 11: Short message alert procedure (terminal memory capacity available)

Information flow	Interface	Parameters needed
Search	SCFv-SDFv	<ul style="list-style-type: none"> PUI/IMSI+CLI/LAid
Search Result	SDFv-SCFv	<ul style="list-style-type: none"> SCFhid
Update subscriber info	SCFv-SCFh	<ul style="list-style-type: none"> PUI/IMSI+CLI/LAid MwStatus
Update subscriber info	SCFh-SDFh	<ul style="list-style-type: none"> PUI/IMSI+CLI/LAid MwStatus
Search	SCFh-SDFh	<ul style="list-style-type: none"> PUI/IMSI+CLI/LAid
Search Result	SDFh-SCFh	<ul style="list-style-type: none"> PUI/IMSI+CLI/LAid ServiceCentreAddress(es)
Subscriber ready for SM	SCFh-IWU	<ul style="list-style-type: none"> PUI/IMSI+CLI/LAid ServiceCentreAddress
alertServiceCentre	IWU-SMSC	<ul style="list-style-type: none"> MSISDN ServiceCentreAddress

NOTE 1: In case of multiple SMSC, last two flows will be repeated as many times as the SMSC number.

NOTE 2: In this case there are some (at least one) previous unsuccessful messages not delivered because of the PT's previous memory full state.

6.5 uSMS delivery notification

In this case, the user originating the short message can request a delivery report showing that the short message has been delivered to the terminating terminal.

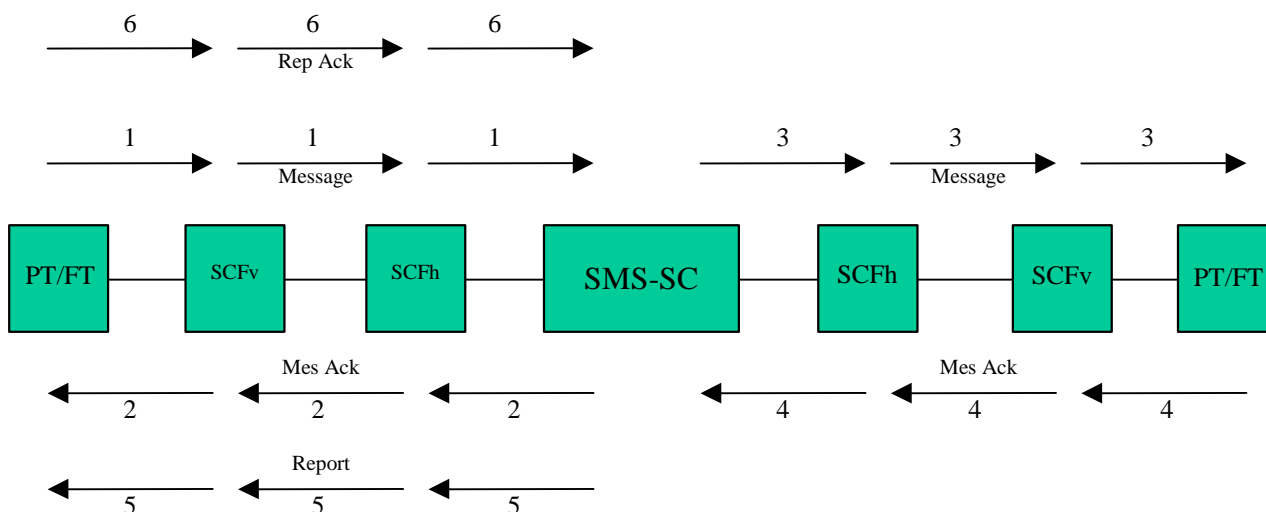


Figure 12: uSMS delivery notification

It is evident that the error analysis proposed for the SMS delivery can be extended to include the Delivery report handshaking.

7 Cell Broadcast uSMS Procedures and Information Flows

This section displays for each procedure information flows; the mapping of these flows to specific protocol messages is outside the scope of the present document.

8 Interworking scenarios and Feature Interaction

No additional functionality is required by uSMS standard to interworking with GSM networks and Internet electronic mail.

Annex A (informative): Universal Short Message Service via PSTN

It is anticipated that terminal originated and terminal terminated uSMS can be delivered via PSTN access using existing industry standards e.g. voiceband modems. Due to the use of a basic call to deliver SMS, this process would not be possible during an existing call.

Bibliography

The following material, though not specifically referenced in the body of the present document (or not publicly available), gives supporting information.

- ETSI DES/SPAN-110093: "Universal Short Message Service (SMS)".

History

Document history		
V1.1.1	March 2000	Membership Approval Procedure MV 20000519: 2000-03-21 to 2000-05-19
V1.1.1	August 2000	Publication