

**Short Message Service (SMS) for fixed networks;  
Network Based Solution (NBS);  
Part 2: Architecture and functional entities**

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Reference

DES/SPAN-130311-2

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Keywords

architecture, ISDN, DSS1, SMS, functional,  
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## Foreword

This ETSI Standard (ES) has been produced by ETSI Technical Committee Services and Protocols for Advanced Networks (SPAN), and is now submitted for the ETSI standards Membership Approval Procedure.

The present document is part 2 of a multi-part standard covering the Short Message Services (SMS) for fixed networks; Networks Based Solution (NBS), as described below:

Part 1: "Overview";

**Part 2: "Architecture and functional entities";**

Part 3: "Integrated Services Digital Network (ISDN) access protocol";

Part 4: "Interworking between Signalling System No.7 (SS7) and Digital Subscriber Signalling System No. one (DSS1)";

Part 5: "Network access protocol".

NOTE: The choice of a multi-part format for this deliverable is to facilitate maintenance and future enhancements.

In accordance with ITU-T Recommendation I.130 [4], the following three level structure is used to describe the supplementary telecommunication services as provided by European public telecommunications operators under the pan-European ISDN:

- Stage 1 is an overall service description, from the user's standpoint;
- Stage 2 identifies the functional capabilities and information flows needed to support the service described in stage 1; and
- Stage 3 defines the signalling system protocols and switching functions needed to implement the service described in stage 1.

The present document details the stage 2 aspects (functional capabilities) needed to support the SM service. The stage 1 aspects are detailed in ES 201 986 [8]. The stage 3 aspects of the SM service have been specified in ES 202 060-1 [11].

The present version updates the references to the basic call specifications.

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## Introduction

The Short Message Service is a service, applicable at the coincident S and T reference point and T reference point, to provide the served user the ability to send and receive Short Messages. The Short Messages are exchanged between the sending and receiving user via a Short Message Service Centre (SM-SC).

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# 1 Scope

The present document specifies the functional architecture of the Short Message Service (SM) service for the pan-European Integrated Services Digital Network (ISDN) as provided by European public telecommunications operators at the T reference point or coincident S and T reference point (as defined in ITU-T Recommendation I.411 [6]) by means of the Digital Subscriber Signalling System No. one (DSS1) protocol. The Functional Architecture as defined in Stage two needed to support a telecommunication service (see ITU-T Recommendation I.130 [4]).

The present document does not specify the additional functional entities or architecture where the service is provided to the user via a telecommunication network that is not an ISDN but it does include interworking requirements of other networks with the public ISDN.

The Short Message Service is provided independently of a call.

Charging principles are outside the scope of the present document.

The Short Message Service enables the originating SMS user to send Short Messages (SMs) to the receiving SMS user via a Short Message Service Centre, belonging to the network of the SMS originating user (served user) or separated from the network of the SMS originating user.

NOTE: The Short Message Service is typically used between a Short Message service provider and a user (receiving user) of the Short Message service provided.

Further parts of the present document specify the method of testing required to identify conformance to the present document.

The present document is applicable to equipment supporting the Short Message Service, to be attached at either side of a T reference point or coincident S and T reference point when used as an access to the public ISDN.

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# 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 and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <http://docbox.etsi.org/Reference>.

- [1] ETSI EN 300 196-1: "Integrated Services Digital Network (ISDN); Generic functional protocol for the support of supplementary services; Digital Subscriber Signalling System No. one (DSS1) protocol; Part 1: Protocol specification".
- [2] ITU-T Recommendation E.164: "The international public telecommunication numbering plan".
- [3] ITU-T Recommendation I.112: "Vocabulary of terms for ISDNs".
- [4] ITU-T Recommendation I.130 (1988): "Method for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN".
- [5] ITU-T Recommendation I.210: "Principles of telecommunication services supported by an ISDN and the means to describe them".
- [6] ITU-T Recommendation I.411 (1993): "ISDN user-network interfaces - Reference configurations".
- [7] ITU-T Recommendation Q.9 (1988): "Vocabulary of switching and signalling terms".

- [8] ETSI ES 201 986 V1.1.2: "Services and Protocols for Advanced Networks (SPAN); Short Message Service (SMS) for PSTN/ISDN; Service description".
- [9] ETSI ES 202 060-3 V1.1.1: "Short Message Service (SMS) for fixed networks; Network Based Solution (NBS); Part 3: ISDN access protocol".
- [10] ETSI ES 202 060-5 V1.1.1: "Short Message Service (SMS) for fixed networks; Network Based Solution (NBS); Part 5: Network access protocol".
- [11] ETSI ES 202 060-1: "Short Message Service (SMS) for fixed networks; Network Based Solution (NBS); Part 1: Overview".

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## 3 Definitions and abbreviations

### 3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

**basic access:** See ITU-T Recommendation Q.9 [7].

**basic call procedures:** procedures by which a call (as an instance of a telecommunications service) is established and terminated

**delivery report:** response from the destination terminal to the SM-SC indicating that an SM has been accepted or not with the appropriate cause, if rejected

**Integrated Services Digital Network (ISDN):** See ITU-T Recommendation I.112 [3].

**invoke component:** where reference is made to a "xxxx" invoke component, an invoke component is meant with its operation value set to the value of the operation "xxxx"

NOTE: See EN 300 196-1 [1], clause 8.2.2.1.

**ISDN number:** number conforming to the numbering plan and structure

NOTE: Specified in ITU-T Recommendation E.164 [2].

**network:** DSS1 protocol entity at the network side of the user-network interface

**originating SMS user:** user that originates and sends the SM

**primary rate access:** See ITU-T Recommendation Q.9 [7].

**private network:** DSS1 protocol entity at the user side of the user-network interface at the T reference point

**public network:** DSS1 protocol entity at the network side of the user-network interface at the T reference point

**receiving SMS user:** user that receives the Short Message and who may also deactivate the reception of SMs and reactivate the reception later on

**receiving user number:** ISDN number of the user, that receives the Short Message

**reject component:** See EN 300 196-1 [1], clause 8.2.2.4.

**reply path procedure:** mechanism which allows an SM-TE to request that an SM-SC should be permitted to handle a reply sent in response to a message previously sent from that SM-TE to another SM-TE

NOTE: This may happen even though the SM-SC may be unknown to the SM-TE which received the initial message.

**return error component:** where reference is made to a "xxxx" return error component, a return error component is meant which is related to a "xxxx" invoke component

NOTE: See EN 300 196-1 [1], clause 8.2.2.3.

**return result component:** where reference is made to a "xxxx" return result component, a return result component is meant which is related to a "xxxx" invoke component

NOTE: See EN 300 196-1 [1], clause 8.2.2.2.

**served user number:** ISDN number of the user who subscribes to, activates, deactivates or interrogates the Short Message services

**service/telecommunication service:** See ITU-T Recommendation I.112 [3].

**Service Centre Time Stamp (SCTS):** information element offering the receiving SM-TE of an SM the information of when the message arrived at the SM-SC

**Short Message (SM):** information, that may be conveyed by means of the SMS described in the present document

**Short Message Service Centre (SM-SC):** function unit, which is responsible for the relaying and store-and-forwarding of a short message (SM) between two SM-TE

NOTE: The SM-SC can functionally be separated from or integrated in the network.

**Short Message Service Centre Number (SM-SCNr):** ISDN number of the Short Message Service Centre

**Short Message Terminal (SM-TE):** terminal which may send or receive short messages.

**status report:** information used to inform the originating SM-TE of the status of a short message previously submitted by this SM-TE

EXAMPLE: Whether the SM-SC was able to successfully forward the message or not, or whether the message was stored in the SM-SC for later delivery.

**submit report:** response from the SM-SC to the originating terminal indicating that an SM has been accepted or not with the appropriate cause, if rejected

**supplementary service:** See ITU-T Recommendation I.210 [5].

**user:** DSS1 protocol entity at the user side of the user-network interface

**Validity Period (VP):** information element enabling the sending SM-TE to indicate the time period during which the originating user considers the SM to be valid

## 3.2 Abbreviations

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

ANLG	ANouncement LanGuage
ASE	Application Service Element
ASN.1	Abstract Syntax Notation One
DLE	Destination Local Exchange
DSS1	Digital Subscriber Signalling System No. One
GW	GateWay
HLR	Home Location Register
ISDN	Integrated Services Digital Network
IW	InterWorking
LE	Local Exchange
MF	Multi Frequency
MSC	Mobile Switching Centre
MTP	Message Transfer Part
NBS	Network Based Solution (bearer unrelated) for the SMS
OLE	Origination Local Exchange
PLMN	Public Land Mobile Network
PSTN	Public Switched Telephone Networks
SCCP	Signalling Connection Control Part
SDL	Specification and Description Language
SM	Short Message

SM-ASE	Short Message-Application Service Element
SM-SCNr	Short Message Service Centre Number
SMPP	Short Message Peer to Peer
SMS	Short Message Service
SM-SC	Short Message Service Centre
SM-TE	Short Message TErminAl
STP	Signalling Transfert Part
TCAP	Transaction CAPabilities
TCP/IP	Transmission Control Protocol/Internet Protocol
TE	Terminal Equipment
TN	Transit Node
UCP	Unified Computer Protocol
USB	User Based Solution (bearer related) for the SMS
VLR	Visitor Location Register

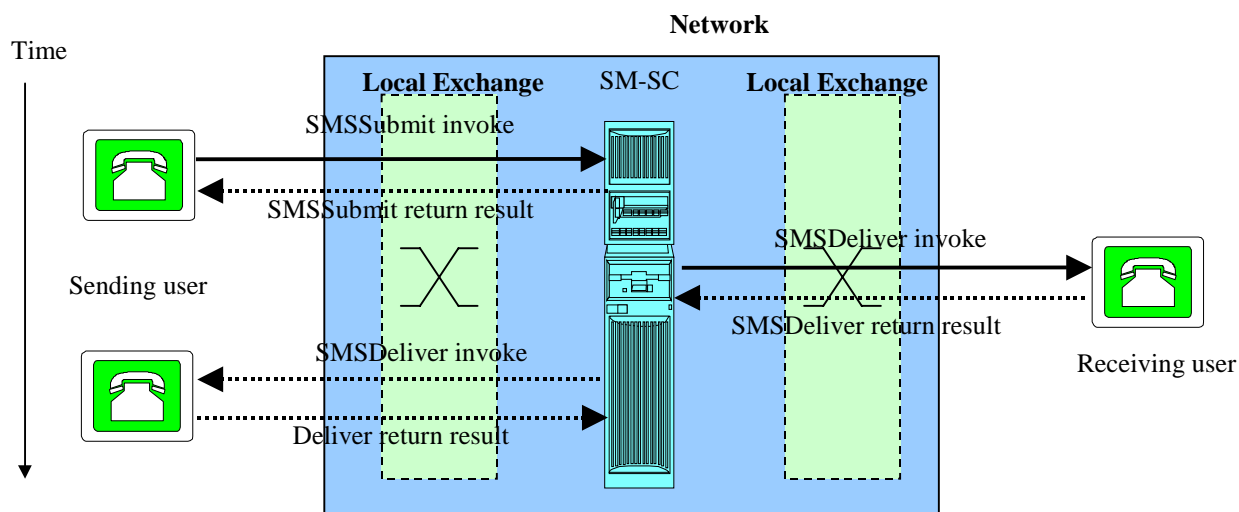
## 4 Overall Description

The Short Message Service (SMS) service shall be available to users who are connected to the network via a basic access or primary rate access.

The Short Message Service (SMS) enables an originating user to send a SM of a limited size to a destination user.

A short message can be initiated upon a request of the sending user or by the service provider itself, and shall be sent to the receiving user.

An SM is always conveyed via an SM-SC. The SM-SC receives the SM from an originating SM-TE (sending user), converts the message if necessary, and relays the SM to the terminating SM-TE (receiving user).



**Figure 1: SMS delivery and confirmation**

A submit report is sent from an SM-SC to an SM-TE and may be either a positive report, which confirms the correct submission of an SM to the SM-SC, or a negative report, which informs the SM-TE that the SM was not successfully submitted with the error reason.

A deliver report is sent to an SM-SC and may be either a positive report, which confirms the correct delivery of an SM to the receiving SM-TE, or a negative report, which informs the SM-SC that the SM was not successfully delivered with the error reason.

If the option to provide a status report is invoked and supported, a status report is sent from the SM-SC to the originating SM-TE; the SM-TE acknowledges correct receipt of the status report.

Having received one or more SMSs, the receiving user can subsequently read, store or delete the messages on its terminal.



NOTE: If the SM-TE supports the optional Replace Short Message Function, Short Messages with the respective Replace Short Message Type indication held in the SM-TE are automatically replaced by received new ones.

The means by which the receiving user manages these features are outside the scope of the present document.

The preparation of an SM as well as the kind of data transmission between the sending or receiving users and the SM-SC are outside the scope of the present document.

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## 5 Basic Operational SMS scenarios

### 5.1 SMS interconnection scenarios between network elements

There are three types of interfaces applicable to SMS:

- the interface between the SMS terminal and the ingress/egress node of the network of the network/service provider (User Network Interface);
- the interface between network elements inside the network of the network/service provider;
- the interface between two or more SM-SCs.

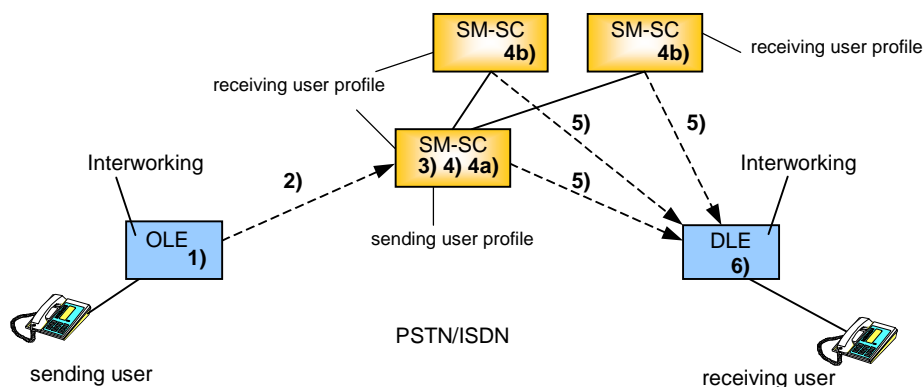
The present document focuses on the interface between network elements inside the network of the network/service provider.

A subscriber has a sending user profile and a receiving user profile in the SM-SC, i.e. some supplementary services for the basic SMS service are related to the sending user and some are related to the receiving user.

If both the sending and the receiving user are served by the same SMS service provider then the sending and receiving user profile may be provided in a same SM-SC. If the service provider implements a distributed SM-SC architecture then the sending user profile and the receiving user profile may be provided in different SM-SC.

If the sending and the receiving user are served by different national or international SMS service providers then the sending user profile is handled by a SM-SC of the service provider of the sending user while the receiving user profile is handled by a SM-SC of the service provider of the receiving user.

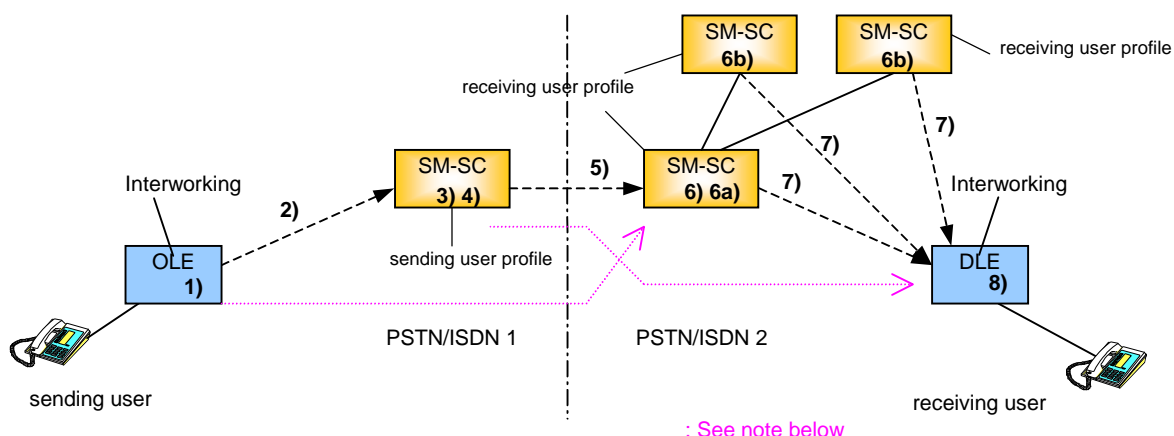
## 5.1.1 PSTN - intra



- 1) Interworking to the network signalling protocol.
- 2) SMS is sent to the SM-SC of the SMS service provider of the sending user.
- 3) SMS is handled according to the sending user service profile.
- 4) The receiving user has a subscription by the **same** SMS service provider as the sending user, the SMS is sent to the receiving user either via the same SM-SC or via a different one (e.g. regional distribution of the SM-SCs).
  - 4a) Same SM-SC: a check of the receiving user profile is made.
  - 4b) Different SM-SC: the SMS is forwarded to the other SM-SC; in the SM-SC a check of the receiving user profile is made.
- 5) The SMS is forwarded to the destination local exchange.
- 6) Interworking to the user signalling protocol and delivery of the SMS receiving user.

**Figure 2: Intra PSTN scenario**

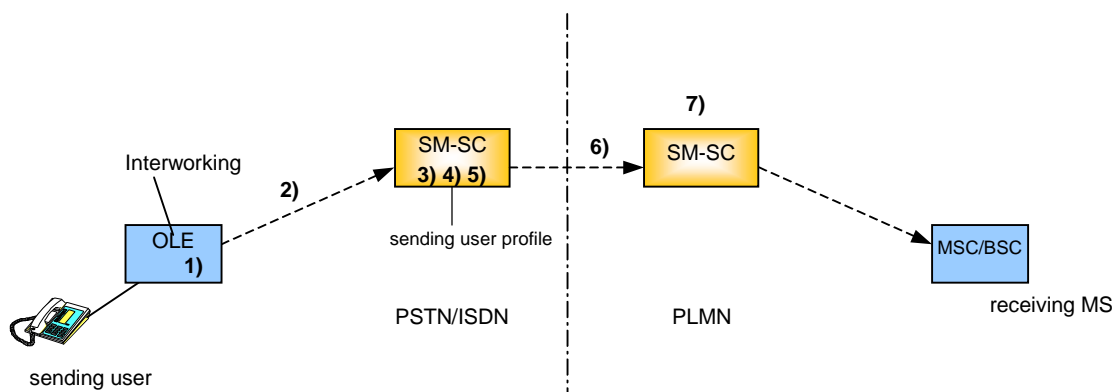
## 5.1.2 PSTN - inter



- 1) Interworking to the network signalling protocol.
  - 2) SMS is sent to the SM-SC of the SMS service provider of the sending user.
  - 3) SMS is handled according to the sending user service profile.
  - 4) The receiving user has a subscription by **another** national or international SMS service provider.
  - 5) The SMS is forwarded to the SM-SC of the service provider of the receiving user.
- NOTE: It may be possible to allow users to interact directly with the SM-SC of the receiving user, assuming the capability of re-direction is supported by step 4); bypassing the SM-SC of the local access network.
- 6) The SMS is sent to the receiving user either via the same (incoming) SM-SC or via a different one (e.g. regional distribution of the SM-SCs).
    - 6a) Same SM-SC: a check of the receiving user profile is made.
    - 6b) Different SM-SC: the SMS is forwarded to the other SM-SC; in the SM-SC a check of the receiving user profile is made.
  - 7) The SMS is forwarded to the destination local exchange.
  - 8) Interworking to the user signalling protocol and delivery of the SMS receiving user.

Figure 3: Inter-PSTN scenario

### 5.1.3 PSTN/ISDN - PLMN



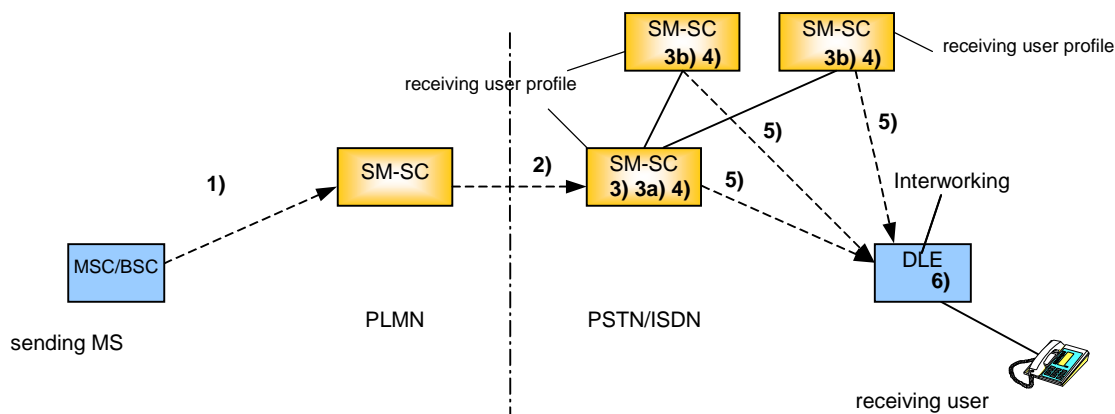
- 1) Interworking to the network signalling protocol.
- 2) SMS is sent to the SM-SC of the SMS service provider of the sending user.
- 3) SMS is handled according to the sending user service profile.
- 4) The SMS shall be sent to the PLMN.
- 5) Mapping of the protocol elements according to GSM requirements.
- 6) The SMS is forwarded to the SM-SC serving the receiving mobile station.

NOTE: It may be possible to allow Users to interact directly with the SM-SC of the receiving user, assuming the capability of re-direction is supported by step 5); bypassing the SM-SC of the local access network.

- 7) Further steps are according to the GSM standards.

**Figure 4: PSTN/ISDN-PLMN scenario**

### 5.1.4 PLMN - PSTN/ISDN



- 1) The steps in the PLMN are according to the GSM standards.
- 2) SMS is sent to the SM-SC of the SMS service provider of the receiving user.

NOTE: It may be possible to allow Users to interact directly with the SM-SC of the receiving user, assuming the capability of re-direction is supported by step 1); bypassing the SM-SC of the local access network.

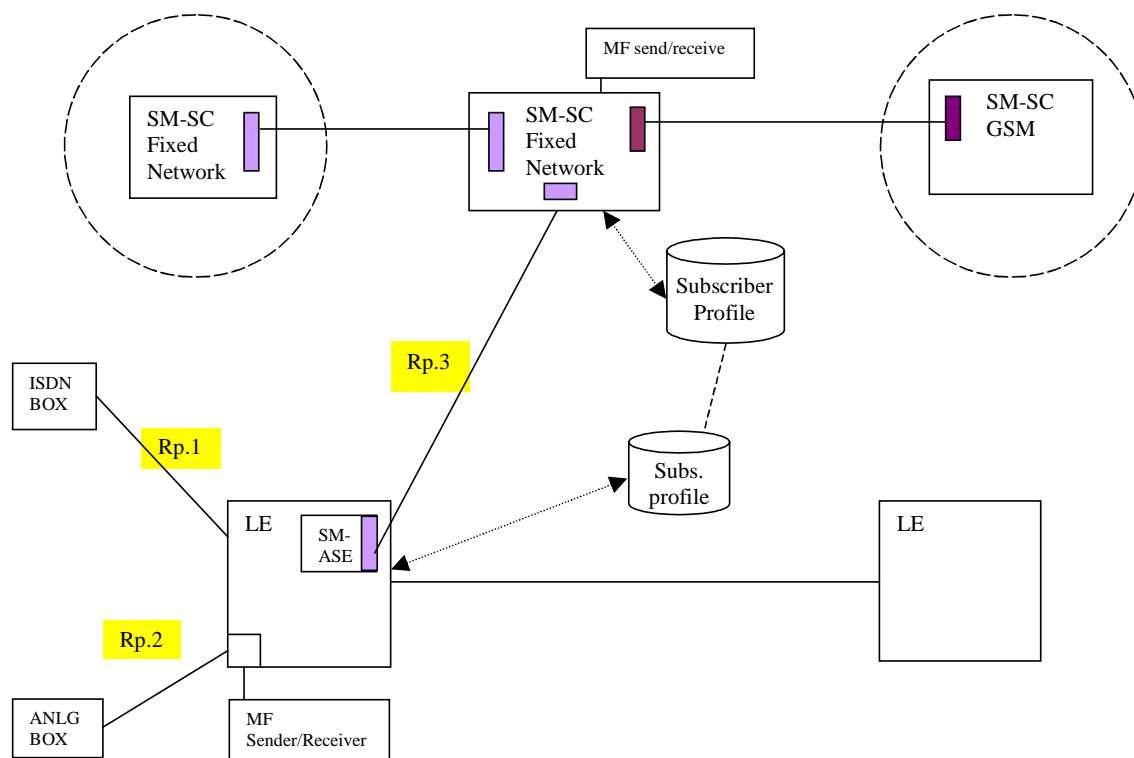
- 3) The SMS is sent to the receiving user either via the same (incoming) SM-SC or via a different one (e.g. regional distribution of the SM-SCs).
  - 3a) Same SM-SC: a check of the receiving user profile is made.
  - 3b) Different SM-SC: the SMS is forwarded to the other SM-SC; in the SM-SC a check of the receiving user profile is made.
- 4) Mapping to the network signalling protocol of the PSTN/ISDN
- 5) The SMS is forwarded to the destination local exchange.
- 6) Interworking to the user signalling protocol and delivery of the SMS receiving user.

**Figure 5: PLMN-PSTN/ISDN scenario**

## 6 Network based SMS functional architecture

### 6.1 Functional model

Currently figures 2 to 5 show the basic operational SMS scenarios, the intention in clause 6 is to extract the reference points and describe the functionality of these reference points. Once defined these reference points will be used to illustrate a functional model in figure 6.



**Figure 6: SMS Functional Model**

### 6.2 Rp.1 (ISDN customer reference point)

Rp.1 defines a reference point between an ISDN SMS terminal adapter and an ISDN Local Exchange. The SM user shall be connected using enhanced DSS1 signalling as specified in ES 202 160-3 [9].

### 6.3 Rp.2 (Analogue customer reference point)

Rp.2 defines a reference point between an analogue SMS terminal adapter and a PSTN Local Exchange interface. For example over a V5 interface.

### 6.4 Rp.3 (OLE to ISDN SMS functional entity reference point)

Rp.3 defines a reference point between an ISDN SMS functional entity and an SM-SC. Many signalling options exist for this interface. The SM Service Provider is be connected between the OLE and SM-SC by an SM-ASE context:

- Option a) SM-ASE context over DSS1;
- Option b) service control API over INAP procedures;
- Option c) a unique context over SCCP; recommended for SMS-NBS, as specified in ES 202 060-5 [10].

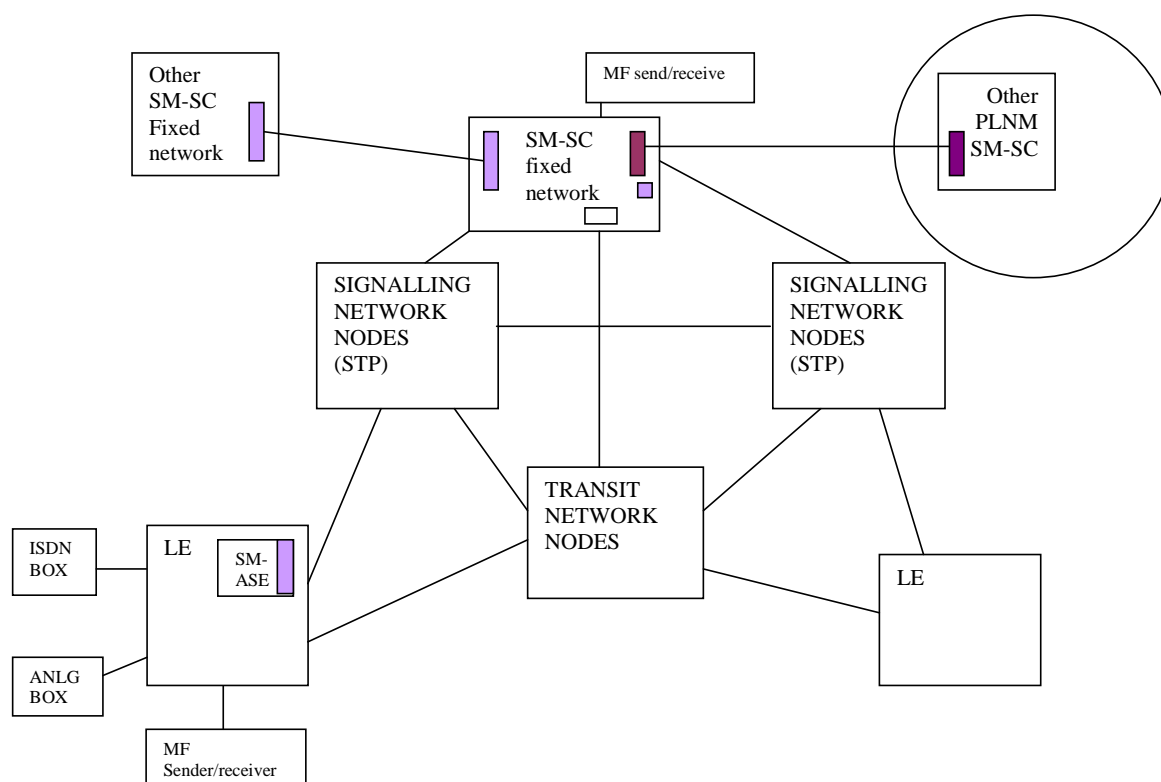
Option d) connected over TCP/IP; etc.

## 6.5 Subscriber Profile

The general network solution, the subscriber profile for SMS-user is stored within the SM-SC. As a network option, some or all of the subscriber profile data may be stored in the PSTN/ISDN (e.g. fraud prevention, SMS user identification, special billing purposes, etc).

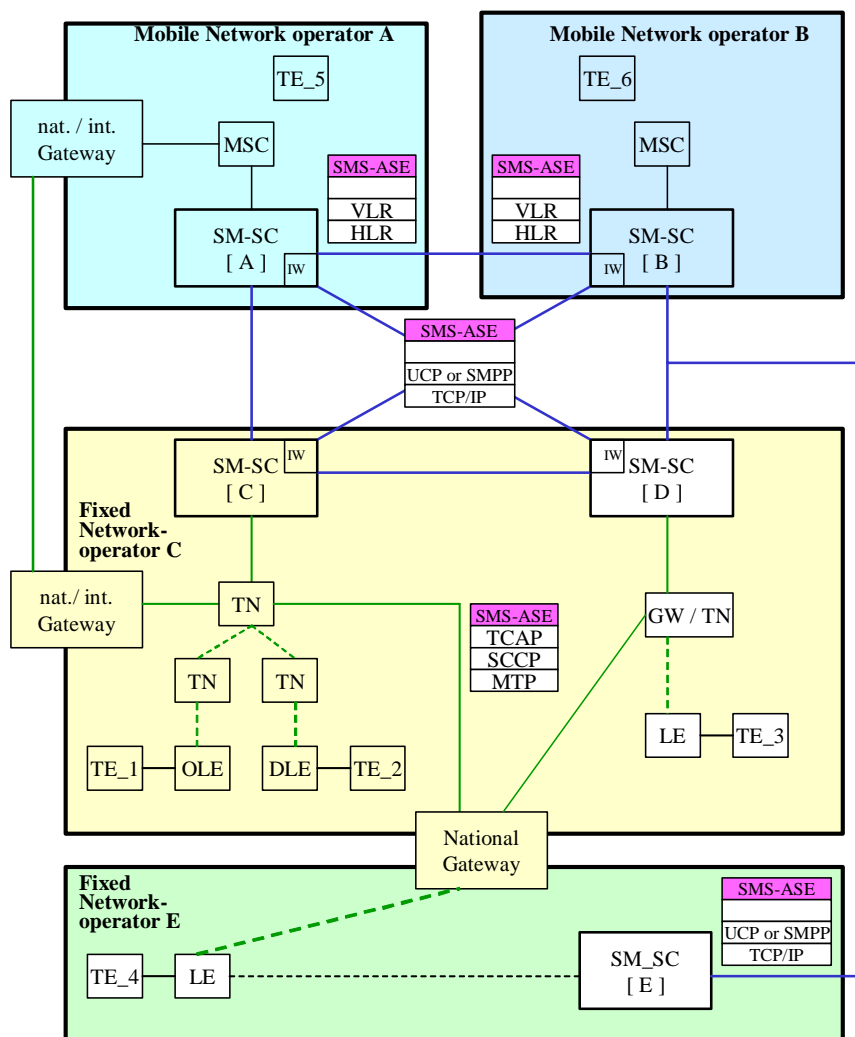
## 7 NBS network reference configuration

A possible reference configuration is shown in figure 7.



**Figure 7: Network Based Short Message Service Reference Configuration**

## 8 SMS network scenarios



**Figure 8: Network architecture and protocol stacks for SMS**

Figure 8 describes the multiple possibilities for delivery an SM in multi operator environment. There are shown:

- two different mobile network operators (A, B), which are also service provider;
- two fixed network operators (C, E), which are also service provider;
- an SMS service provider (D); whereby the service provider D is inside the network of the fixed network operator C.

Transport of SM, routing and used technology are based on bilateral agreements between the related service provider and/or network provider.

## 8.1 Exchange of SM between SM-SC

There are two possibilities for Network Operator/Service Provider to exchange SMs between different SM-Sacs:

### Option a) Via SM-SC

The short message service centre (SM-SC) are connected by a backbone network shown by the blue lines. The transport protocol which is used there, may be include the protocol stacks e.g. TCP/IP with UCP and/or SMPP and the SM-ASE; or

### Option b) Via SS7 (NBS)

SM can be exchanged by Network Operator/Service Provider using SS7, shown by the green lines. In this case, the relevant protocol stacks are MTP, SCCP, TCAP and the SM-ASE (as described in ES 202 060-5 [10]).

## 8.2 SMs from a sending user to a SM-SC

The basic scenarios, as described in clause 5, expresses that the SMS traffic may be settled directly via SM-SC in one network (see figure 2; network provider = service provider) or different SM-SC, represented by different network/service provider (see figures 3 and 4).

For the SMs delivery from a sending user to a SM-SC there will be two possibilities with different advantages/disadvantages for the network operator related to the implementation of SMS in a network.

### 8.2.1 First possibility

Independently from the dialled SM-SC number by the customer, in a first step the SM-call will be routed to an SM-SC which belongs to the network operator, where the customer is connected to. In a second step the SM will be delivered to the SM-SC, dialled by the customer.

**EXAMPLE:** All SMs, generated from TE 1 or TE 2 in the fixed network C will be transmitted via SM-SC of the fixed network operator C.

ES 202 060-3 [9] was provided to support the NBS for the first passage from the terminal equipment to the OLE. For the second passage it may be used TCP/IP with UCP or a unique context over SCCP as described in ES 202 060-5 [10]. The network solution which will be used depends from the kind of interconnection and bilateral agreements. In figure 8, these connections are shown by green or blue lines.

### 8.2.2 Second possibility

The SM-call will be routed directly to the SM-SC related to the number which was dialled by the customer.

For the first passage from the terminal equipment to the OLE, to support the NBS, there was provided ES 202 060-3 [9]. For the second passage, many signalling options as described in clause 6.3 exists for this interface. Both network/service provider must support this interface. For the network based solution a unique context over SCCP is specified in ES 202 060-5 [10]. In figure 8, these connections are shown by the green marked lines.

**EXAMPLE:** TE 1 chooses the number of the SM-SC of the mobile network operator A. The call will be routed over OLE, TN, Gateway of fixed network operator C to the gateway of the mobile network operator A and than to the SM-SC of the mobile network operator A.



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## Annex A (informative): Bibliography

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ETSI TS 123 040 V5.3.0: "Digital cellular telecommunications system (GSM); Universal Mobile Telecommunications System (UMTS); Technical realization of the Short Message Service (SMS) (3GPP TS 23.040 version 5.3.0 Release 5)".

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## History

<b>Document history</b>		
V1.1.1	March 2003	Membership Approval Procedure    MV 20030502: 2003-03-04 to 2003-05-02