COMMUNICATIONS ALLIANCE LTD

INDUSTRY GUIDELINE

MOBILE NUMBER PORTABILITY- NETWORK PLAN FOR SMS

G565:2009

G565:2009 Mobile Number Portability – Network Plan for SMS

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1 INTRODUCTION

1.1 Introduction of MNP

Number portability for mobile numbers was implemented in Australia in accordance with the ACMA *Telecommunications Numbering Plan 1997*, the Australian Competition and Consumer Commission's (ACCC's) directions to the Australian Communications Media Authority (ACMA) and the implementation date of 25th September 2001 set by the ACMA.

1.2 Number Portability for Mobile Numbers

1.2.1 Mobile Number Portability (MNP) is the ability for a customer to change mobile Carriage Service Provider (CSP) and/or mobile Carrier whilst retaining their mobile number.

1.2.2 Under MNP only the mobile number is ported. The basic and supplementary services provisioned in the recipient network are not dependent on those that were provisioned in the losing network.

1.2.3 As a consequence of MNP, the Terminating Access Service Deliverer (TASD) can not be reliably determined from the number range allocated to a mobile CSP.

1.2.4 Routing of voice, data and fax in the MNP environment is specified in the ***Network Plan for Voice, Data and Fax Services*** Guideline (G561:2009), which allows for a combination of donor routing and direct routing. Although these routing methodologies will ensure end to end connectivity for those types of mobile communication, the Short Message Service requires a separate plan because short messages are routed differently from voice calls and interconnection of short messages between different technologies is still evolving.

1.3 Scope

1.3.1 There is currently no regulatory requirement to provide inter-carrier SMS. Intercarrier SMS is established through commercial arrangements on a bilateral basis. This plan specifies industry agreed routing arrangements and error code treatment to enable correct delivery of inter-carrier Short Message (SM) under mobile number portability. The plan applies only to inter-carrier messages which are communicated via GSM MAP signalling and/or SMPP international standards, between mobile digital networks that conform to either GSM or CDMA standards. Changes to these international standards or the deployment of a different mobile network technology may give rise to a need to revise this plan.

1.3.2 This SMS network plan provides:

(a) support for full intra- and inter-technology SMS for portable mobile numbers;

(b) support for incoming international SMS to portable mobile numbers (via GSM MAP only);

(c) support for national and international roaming;

(d) for the treatment of error cases;

(e) for the prevention of circular routing.

1.3.3 This plan does not require any modification to the GSM MAP or SMPP protocol. An item not specified in this plan that needs to be specified and agreed via bilateral agreement is addresses of network elements not publicly available (applicable to GSM MAP);

1.3.4 Charging capabilities are outside the scope of this plan.

1.4 Routing principles

1.4.1 The SMS routing principles recommended in this Plan ensure that inter-carrier short messages are delivered to the correct TASD in the MNP environment.

1.4.2 This plan specifies two routing mechanisms:

(a) Direct routing for a SM originated from an SMSC that forms part of an Australian PLMN; and

(b) Donor routing for a SM originated from an SMSC that does not form part of an Australian PLMN.

Direct routing requires the Originating Access Service Deliverer (OASD) to determine the correct Terminating Access Service Deliverer (TASD) and to route the SM accordingly.

Donor routing means the OASD routes the SM query to the donor network (Carrier assigned by the CSP that has been allocated the number block by the ACMA).

1.4.3 Connectivity for SMS and compatibility of protocols between all parties involved in donor routing can not be guaranteed. Therefore direct routing between the OASD and the correct TASD must be supported wherever bilateral agreements for national inter-carrier SMS exist.

1.4.4 Where internationally originated SMS is supported donor routing must be supported wherever bilateral agreement exists for the national leg, as international networks are not likely to access an Australian mobile number portability database prior to routing the message. However, certain limitations apply – see Appendix A.

1.4.5 A SMS Transit Service Deliverer (STrSD) can be contracted by any CSP in order to fulfil requirements of this plan. It is the responsibility of the contracting CSP to ensure that any STrSD employed is compliant with this plan.

1.4.6 A STrSD is contracted by an OASD to determine the TASD for portable number ranges and route messages accordingly. A STrSD may also be contracted by a TASD to deliver messages to the network of the TASD. The same or different STrSD may be used to deliver messages to and from the network. Any CSP can act as a STrSD. The OASD and the STrSD may agree that their contractual arrangement will apply to a subset of all mobile number ranges. An OASD may use more than one STrSD.

1.4.7 For the purpose of this plan, where a STrSD is used by OASD or TASD, the network of the STrSD and the OASD or TASD (as applicable) are regarded as a single virtual network. The STrSD and the OASD or TASD (as applicable) using its services must ensure circular routing does not occur.

1.4.8 The TASD must not transit a nationally originated SM whether delivered via the STrSD or directly from the OASD.

1.4.9 No additional routing arrangements are required for national or international roaming.

1.5 2009 Revision

In 2009, the Mobile Number Portability Code was revised. At that time all associated Mobile Number Portability documents were republished as Communications Alliance documents to reflect the change of organisational name from ACIF. Where relevant any references to other documents have also been updated.

2 ACRONYMS

2.1 Acronyms

ACCC

Australian Competition and Consumer Commission

ACIF

Australian Communications Industry Forum

ACMA

Australian Communications and Media Authority

CCS

Common Channel Signalling

CDMA

Code Division Multiple Access

CSP

Carriage Service Provider

ESME

External Short Message Entity

GSM

Global System for Mobiles

HLR

Home Location Register

IMSI

International Mobile Subscriber Identity

MAP

Mobile Application Part

MNP

Mobile Number Portability

MSC

Mobile Switching Centre

MSISDN

Mobile Station ISDN Number

OASD

Originating Access Service Deliverer

PDU

Protocol Data Unit

PLMN

Public Land Mobile Network

POI

Point Of Interconnection

SM

Short Message

SMPP

Short Message Peer to Peer

SMS

Short Message Service

SMSC

Short Message Service Centre

STrSD

SMS Transit Service Deliverer

TASD

Terminating Access Service Deliverer

TCP/IP

Transmission Control Protocol / Internet Protocol

VLR

Visitor Location Register

3 SHORT MESSAGE SERVICE

3.1 General

3.1.1 The Point-to-Point SMS provides a means of sending messages of limited size to a mobile customer. The provision of SMS makes use of a Short Message Service Centre (SMSC), which may function as a store and forward centre for short messages.

3.1.2 Mobile terminated SM denotes the capability of a SMSC to transfer a SM to a mobile customer and be provided with the information about the delivery status of the SM. This is achieved typically by a delivery report or a failure report with a specific mechanism for later delivery.

3.1.3 Unsuccessful message transfer from the SMSC to a mobile customer may be caused by a variety of different errors. Errors are either permanent or temporary in nature. For permanent errors no further attempts are made to deliver the message to the mobile customer. Temporary errors may result in subsequent delivery attempts.

4 SM DELIVERY VIA GSM MAP

In GSM MAP responsibility for SM delivery to a mobile customer lies at all times with the originating SMSC, and can not be passed to any other SMSC.

4.1 General

4.1.1 The general architecture for inter-carrier SMS via GSM MAP is shown in the Figures 1 and 2, and can be used in any of the following cases:

(a) National GSM to national GSM (Figure 1)

(b) International GSM to national GSM (Figure 2)

4.1.2 Of the GSM MAP messages used to send an SM, two are affected by MNP – sendRoutingInfoForShortMsg and setMessageWaitingData, as these rely on the MSISDN for addressing.

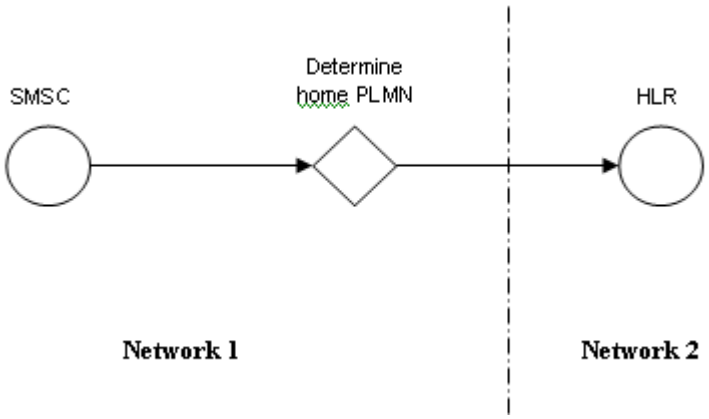

FIGURE 1
Direct Routing

NOTE: The OASD determines the correct home PLMN

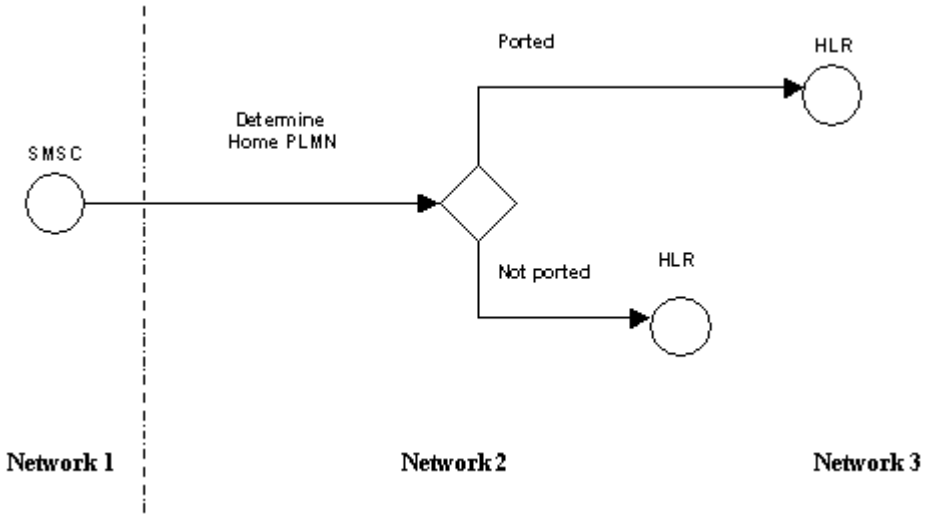

FIGURE 2
Donor Based Routing

NOTE: The OASD routes the affected signalling messages to the donor network (the network assigned by the CSP that has been allocated that number block by the ACMA), which will determine the correct home PLMN.

4.2 Routing principles

4.2.1 The GSM MAP routing principles will ensure that under a MNP environment:

(a) messages are routed directly to the correct recipient network (for nationally originated SMS);

(b) messages are routed to the network holding the number block allocation of the destination number (only for internationally originated SMS); and

(c) circular routing is avoided.

4.2.2 The plan presumes that messages originated from an international network to ported numbers (see Clause 4.1) will be delivered via donor based routing, as international networks cannot be expected to access an Australian mobile number portability database prior to routing the message.

4.2.3 When porting occurs across GSM and CDMA technologies, SMS can not be fully supported using donor based routing. Delivery between the originating and donor carrier, or donor and terminating carrier may not be supported, even if delivery between the originating and terminating carrier is supported. Therefore donor based routing using GSM MAP can not deliver equivalent service.

4.2.4 The type of routing applicable to a particular traffic case is shown in Table 1.

TABLE 1
GSM MAP Routing Cases

Traffic case	Donor based routing	Direct routing
National GSM to national GSM	No	Yes
International GSM to national GSM	Yes	No

4.2.5 It should be noted that a customer with a ported number will be able to receive an internationally originated SM only from the common international roaming partners of the donor and recipient network, where connectivity between donor and recipient exists – see Appendix A.

4.3 Addressing across point of interconnection

4.3.1 The number structure used for the addressing across the Point of Interconnection (POI) must be in the international format as defined in ITU-T Recommendation E.164.

4.4 Prevention of circular routing

4.4.1 It is necessary to guard against the possibility that the porting data for a mobile number is inconsistent between databases used for routing in different networks. In-bound sendRoutingInfoForShortMsg and setMessageWaitingData messages addressed to a number that does not belong to a mobile CSP's allocated number block must not be transited to another network.

4.5 Error codes

4.5.1 Unsuccessful SM delivery may be caused by a variety of different errors. Error treatment in general will follow the pertinent specification ***ETS 300 536: October 1996*** (GSM 03.40 v 4.13.0).

4.5.2 Two cases arise where unsuccessful delivery is due to the implementation of MNP. The error codes that apply to each case are as follows:

(a) SM delivery to a mobile number ported to a network where there is no inter-carrier SMS connectivity will be unsuccessful. The error code to be returned to the originating SMSC shall be any permanent error code from the pertinent specification.

(b) Due to the misalignment of data in routing databases, sendRoutingInfoForShortMsg and setMessageWaitingData message may be delivered to the wrong network after the originating network has performed a lookup. The receiving network can deal with the error on either MAP or SCCP level. The MAP level error treatments must follow ETS 300 536: October 1996 (GSM 03.40 v 4.13.0). The SCCP level error treatment must follow ITU-T SCCP suite of specifications (Q.711 to Q.714).

5 SM DELIVERY VIA SMPP

5.1 SMPP Protocol

5.1.1 The SMPP protocol is based on the exchange of request and response Protocol Data Units (PDUs) between an External Short Message Entity (ESME) and a SMSC over an underlying TCP/IP or X.25 network. It can allow SMs to be passed between mobile networks, regardless of the originating and destination technologies.

5.1.2 SMPP allows messages to be passed between SMSCs. Responsibility for SM delivery to a mobile customer is also passed between SMSCs (unless a DATA_SM delivery is attempted).

5.1.3 No specific version of the SMPP protocol is required by this plan however SMPP version 3.3 has been used as a base for this plan. The actual SMPP version used is a matter for bilateral agreement between carriers.

5.2 General

5.2.1 The general architecture for inter-carrier SMS via SMPP is shown in Figure 7-1, and can be used in any of the following cases:

(a) National CDMA to national CDMA

(b) National CDMA to national GSM

(c) National GSM to national GSM

(d) National GSM to national CDMA

5.2.2 The following message types are affected by MNP: SUBMIT_SM, and DELIVER_SM. Two message types from SMPP v3.4 are also affected: SUBMIT_SM_MULTI and DATA_SM.

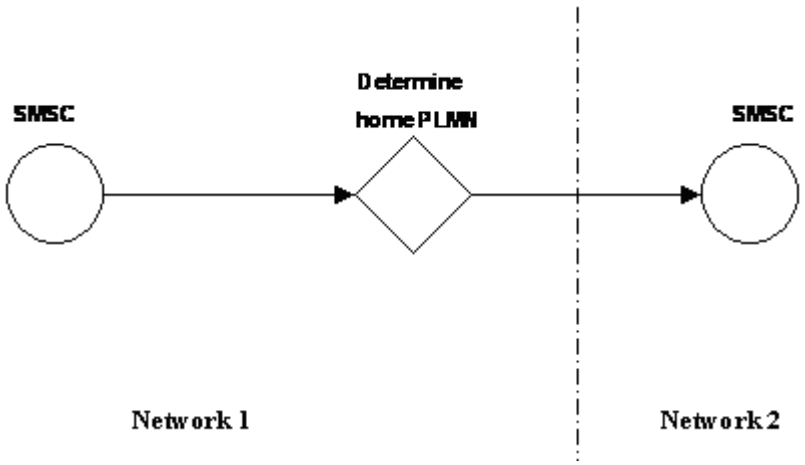

FIGURE 3
Direct Routing

NOTE: OASD determines correct home PLMN and routes SM accordingly.

5.3 Routing principles

5.3.1 The SMPP routing principles will ensure that under a MNP environment:

(a) messages can be routed directly to the correct recipient network; and

(b) circular routing is avoided.

5.3.2 Type of routing applicable to a particular traffic case is shown in the Table 2.

TABLE 2
SMPP Routing Cases

Traffic case	Donor based routing Note 1	Direct routing
National CDMA to national CDMA	No	Yes
National CDMA to national GSM	No	Yes
National GSM to national GSM	No	Yes
National GSM to national CDMA	No	Yes

NOTE: Requires SMPP connectivity between all participating MNP carriers

5.3.3 A mobile carrier that receives a SUBMIT_SM, SUBMIT_SM_MULTI, DATA_SM or DELIVER_SM PDU must not forward the message to an SMSC outside its own network. On receipt of such PDUs it will either:

(a) acknowledge receipt and

(i) attempt delivery to the handset on its own network, or

(ii) attempt delivery to the handset roaming on another network;

or

(b) reject the submission with a response command status of ESME_RINVDSTADR. This has value 0x0000000B – invalid destination address.

5.4 Addressing across point of interconnection

5.4.1 The number structure used for the addressing across the POI must be in the international format as defined in ITU-T Recommendation E.164.

5.5 Prevention of circular routing

5.5.1 In order to guard against the possibility that the porting data for a mobile number is inconsistent between databases used for routing in different networks, in-bound Short Messages addressed to a number that does not belong to a mobile carrier's own allocated or assigned number block must not be transited to another network. As donor routing is not permitted, all CSPs must terminate Short Messages received from another network. This rule does not preclude the use of a STrSD by a CSP (refer to Section 1.3).

5.6 Error codes

5.6.1 The error code ESME_RINVDSTADR must be returned in all instances where a MNP error is identified. This error code must be treated as a permanent error.

6 SMS BETWEEN GSM AND CDMA

6.1 Introduction

6.1.1 SM delivery between GSM and CDMA can be supported, but translation decisions have to be made when converting between the two protocols. In any conversion between technologies it may not be possible to preserve all information.

6.1.2 SMS in GSM and CDMA are broadly analogous but not identical. Some differences are listed:

(a) message concatenation (GSM feature only)

(b) message length

(c) callback number (CDMA feature only)

(d) protocol ID and associated services (GSM only)

(e) message type (CDMA only)

(f) message encoding (different for GSM and CDMA)

(g) inter-SMSC message transfer (not supported in GSM MAP)

6.2 SM conveyance by SMPP

6.2.1 SMPP allows messages to be passed between SMSCs. Responsibility for SM delivery to a mobile customer is also passed between SMSCs (unless a DATA_SM delivery is attempted).

6.2.2 SMs between GSM and CDMA networks can be delivered via SMPP without any further need for protocol conversion. Differences in supported features need to be considered and agreement reached bilaterally.

6.3 SM conveyance by GSM MAP

6.3.1 In GSM MAP responsibility for SM delivery to a mobile customer lies at all times with the originating SMSC, and can not be passed to any other SMSC.

6.3.2 SM delivery from GSM to CDMA networks via GSM MAP will involve a form of protocol conversion. This plan assumes protocol conversion to SMPP. Either the transit or terminating network, as bilaterally agreed, will need to provide appropriate HLR and MSC/VLR functionality to allow the delivery.

6.3.3 Differences in supported features need to be considered and agreement reached bilaterally.

6.3.4 SM delivery from CDMA to GSM networks via GSM MAP is for further study.

6.4 General

6.4.1 The general architecture for inter-carrier SMS between GSM and CDMA is shown in the Figure 4, and is applicable to any of the following cases:

(a) National GSM to national CDMA

(b) International GSM to national CDMA

(c) National CDMA to national GSM

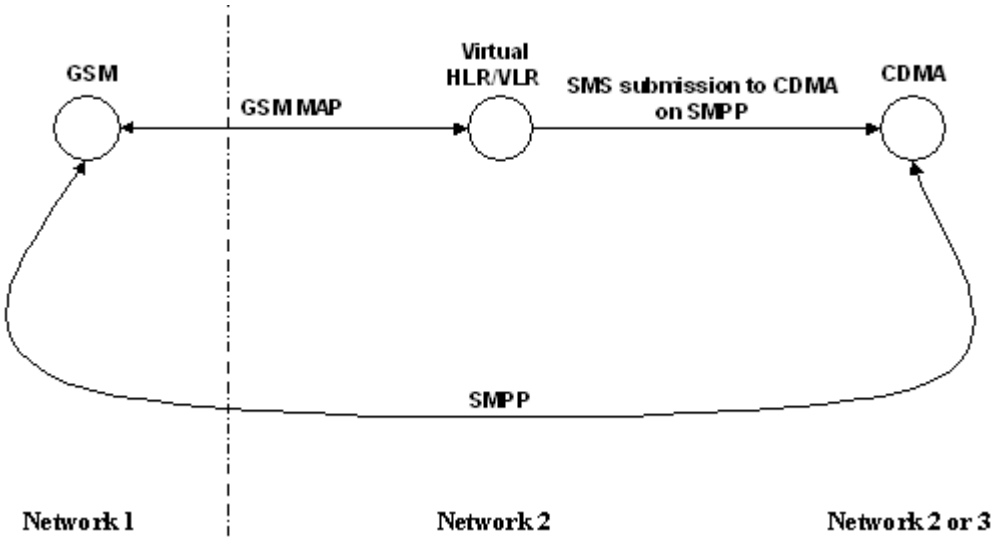

FIGURE 4

General Architecture for Inter-Carrier SMS between GSM and CDMA

6.5 Routing principles

6.5.1 The routing principles will ensure that under a MNP environment:

(a) messages can be routed directly to the correct recipient network;

(b) messages can be routed to the network holding the block number allocation of the destination number; and

(c) circular routing is avoided.

6.5.2 Type of routing applicable to a particular traffic case is shown in Table 3.

TABLE 3

Routing Cases between GSM and CDMA

Traffic case	Donor based routing	Direct routing
National GSM to national CDMA	No	Yes
International GSM to national CDMA	Yes	No
National CDMA to national GSM	No	Yes

6.5.3 In any SMS conveyance between mobile carriers, features supported by both originating and terminating network may not be supported by other networks. Therefore where donor based routing is used some features may not be preserved – see Appendix A.

6.6 SM conveyance by SMPP

6.6.1 Routing principles are as per Section 5.3 of this plan.

6.7 SM conveyance by GSM MAP

6.7.1 In the case of Short Messages conveyed via GSM MAP from GSM to CDMA network, implied IMSI and address of a protocol converter must be returned in sendRoutingInfoForShortMsg_Response and setMessageWaitingData_Response message, rather than the IMSI and the MSC number of the called party. Message delivery will happen from a GSM SMSC to an entity which assumes role of GSM MSC/VLR in terms of message flow. The entity may reside in either the transit or terminating network, as bilaterally agreed.

6.8 Addressing across point of interconnection

6.8.1 The number structure used for the addressing across the POI must be in the international format as defined in ITU-T recommendation E.164.

6.9 Prevention of circular routing

6.9.1 In order to guard against the possibility that the porting data for a mobile number is inconsistent between databases used for routing in different networks, the methods specified in 4.4 and 5.5 of this plan will apply for the appropriate portions of SM delivery.

6.10 Error codes

6.10.1 Permanent MNP error codes must be preserved as permanent error codes in all conversions between GSM MAP and SMPP. Error codes specified in 4.5 and 5.6 of this plan must apply for the appropriate portions of SM delivery.

6.10.2 During the testing period, regular (e.g. daily or as the need arises) telephone conference will be arranged between the Communications Alliance MNP NTSG and testing participants to review progress of testing, as well as any issues and faults.

6.10.3 A Test Coordinator will be nominated by the Communications Alliance MNP NTSG to coordinate the above meetings and to compile the Test Summary Report.

7 REFERENCES

Publication	Title
Industry Codes	
C570:2009	Mobile Number Portability
Industry Guidelines	
G561:2009	Mobile Number Portability - Network Plan for Voice, Data and Fax Services
ETSI Standard	
ETS 300 536 (GSM 03.40 v 4.13.0)	Digital cellular telecommunications system (Phase 2); Technical realization of Short Message Service (SMS) Point-to-Point (PP) (GSM 03.40)
SMPP Development Forum	
ETS 300 536 (GSM 03.40 v 4.13.0)	Short Message Peer to Peer Protocol Specification v3.3
International Telecommunications Union	
E.164 (05/97)	The international public telecommunication numbering plan
Q.713 (07/96)	Signalling Connection Control Part formats and codes

APPENDIX

A INTERNATIONALLY ORIGINATED SMS

This plan relies on the support of donor routing within Australia for internationally originated SMS. The connectivity and features delivered will depend on a number of factors:

(a) whether the originating international network has roaming agreements with all involved parties: donor and recipient network;

(b) whether the donor network has SMS connectivity with the recipient network;

(c) what protocol is implemented between donor and recipient networks (assuming there is connectivity).

All call cases listed in Table 4 assume that the protocol used for the conveyance of internationally originated Short Messages between the international OASD and the donor is GSM MAP, as per paragraph 1.3 of this plan.

Depending on the type of donor and recipient network, as well as the protocol implemented, a summary of SM delivery scenarios is shown in Table A-1, outlining if connectivity can be achieved and whether some or all features can be preserved in the process.

TABLE 4

Summary of SM Delivery Scenarios

Donor	Recipient	O=>D Bilateral	D=>R Bilateral	O=>R Bilateral	Outcome	
GSM/CDMA	**GSM/CDMA**	**Y/N**	**Y/N**	**Y/N**	**Connectivity**	**Features**
GSM	GSM	Y (MAP)	Y (MAP)	Y (MAP)	Y	All
GSM	GSM	Y (MAP)	Y (SMPP)	N/A	Y	Partial to All
GSM	GSM	Y (MAP)	Y (MAP)	N	N	None
GSM	GSM	Y (MAP)	N	N/A	N	None
GSM	GSM	N	N/A	N/A	N	None
GSM	CDMA	Y (MAP)	Y (SMPP)	N/A	Y	Partial to All
GSM	CDMA	Y (MAP)	N	N/A	N	None
GSM	CDMA	N	N/A	N/A	N	None
CDMA	GSM	N/A	N/A	N/A	N	None

Legend:
- O=>D Connectivity between originating and donor network, and protocol type (GSM MAP or SMPP)
- D=>R Connectivity between donor and recipient network, and protocol type (GSM MAP or SMPP)
- O=>R Connectivity between originating and recipient network, and protocol type (GSM MAP or SMPP)
- Y YES
- N NO

N/A Not Applicable

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The Working Committee responsible for the revisions made to this Guideline consisted of the following organisations and their representatives:

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Paradigm.One	Dev Gupta
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Telstra	Mark Podzuweit
Telstra	Ray Pearson
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This Working Committee was chaired by Alexander R. Osborne. Visu Thangavelu of Communications Alliance provided project management support.

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