TTC仕様書
Technical Specification

TS-3GB-X.S0048-0v1.0
Short Message Service Over IMS

2008 3 7

THE TELECOMMUNICATION TECHNOLOGY COMMITTEE

TS-3GB-X.S0048-0v1.0

Short Message Service Over IMS

[Remarks]

[Application level of English description]

[Application level]　E2

[English description is included in the text and figures of main body, annexes and appendices.]

[Relationship with international recommendations and standards]

3GPP2　　　　　　　　Technical Specification X.S0048-0 (Version 1.0)

[This standard is standardized based on the Technical Specification X.S0048-0(Version 1.0) approved by 3GPP2.]

[Departures from international recommendations]

[Changes to original standard]

TTC　　　　　　　　　　[Standards referred to in the

original standard, which are replaced by TTC standards.]

TTC

TTC　　　　　　　　　　　　　　　　[Standards referred to in the original standard

should be replaced by derived TTC standards.]

[IPR]

[Status of "Confirmation of IPR Licensing Condition" submitted is provided in the TTC web site.]

[Working Group]

3GPP2　　　　　　[3GPP2 Working Group]

3GPP2 X.S0048-0

Version: v1.0

Date: November 2007

Short Message Service over IMS

Short Message Service over IMS

CONTENTS

LIST OF FIGURES

FOREWORD

(This foreword is not part of this document)

"Shall" and "shall not" identify requirements to be followed strictly to conform to this document and from which no deviation is permitted. "Should" and "should not" indicate that one of several possibilities is recommended as particularly suitable, without mentioning or excluding others, that a certain course of action is preferred but not necessarily required, or that (in the negative form) a certain possibility or course of action is discouraged but not prohibited. "May" and "need not" indicate a course of action permissible within the limits of the document. "Can" and "cannot" are used for statements of possibility and capability, whether material, physical or causal.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

REVISION HISTORY

Revision	Date	Remarks
1.0	October 2007	Initial publication

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

This page is intentionally left blank.

1   Scope

The present document provides SMS over IMS procedures based upon [MMD Part-4] and [MMD Part-10].

The present document is applicable to Application Servers (ASs) and User Equipments (UEs) providing SMS over IMS functionality.

It is the goal of this specification to allow the core network to know as closely as possible, the current accessibility of the UE and to deliver SMS efficiently across the appropriate access network while minimizing the impact on the legacy systems.

2   References

2.1   Normative References

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. ANSI and TIA maintain registers of currently valid national standards published by them.

- 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. In the case of a reference to a 3GPP2 document, a non-specific reference implicitly refers to the latest version of that document in the same Release as the present document.

[C.S0015]   3GPP2 C.S0015-B: "Short Message Service (SMS) for Wideband Spread Spectrum Systems".

[MAP]   3GPP2 X.S0004-E: "Mobile Application Part (MAP)".

[MMD Part-2]   3GPP2 X.S0013-002-A: "IP Multimedia Subsystem; Stage 2".

[MMD Part-4]   3GPP2 X.S0013-004-0: "IP Multimedia Call Control Protocol Based on SIP and SDP; Stage 3".

[MMD Part-5]   3GPP2 X.S0013-005-A v1.0: "IP Multimedia Subsystem Cx Interface Signaling Flows and Message Contents".

[MMD Part-10]   3GPP2 X.S0013-010-A v1.0: "IP Multimedia Subsystem Sh Interface; Signaling Flows and Message Contents – Stage 2".

[RFC 3261]   IETF RFC 3261: "SIP: Session Initiation Protocol".

[RFC 3263]   IETF RFC3263: "Session Initiation Protocol (SIP): Locating SIP Servers".

[RFC 3428]   IETF RFC 3428: "Session Initiation Protocol (SIP) Extension for Instant Messaging".

[RFC 3761]	IETF RFC 3761: "The E.164 to Uniform Resource Identifiers (URI) Dynamic Delegation Discovery System (DDDS) Application (ENUM)".
[TCAP]	ANSI T1.114-1988: Signaling System Number 7 - Transaction Capabilities Application Part (TCAP).
[VCC]	3GPP2 X.S0042-0 v1.0: "Voice Call Continuity between IMS and Circuit Switched Systems".
[MIME-SMS]	http://www.iana.org/assignments/media-types/application/vnd.3gpp2.sms
[MIME-TCAP]	http://www.iana.org/assignments/media-types/application/vnd.3gpp2.tcap

2.2   Informative References

Void.

3   Acronyms and Definitions

3.1   Acronyms

ADDS	Application Data Delivery Service
ANSI	American National Standards Institute
AS	Application Server
B2BUA	Back-to-Back User Agent
BSC	Base Station Controller
CS	Circuit-Switched
CSCF	Call/Session Control Function
CSM-MO	Circuit Switched Short Message Mobile Originated
CSM-MT	Circuit Switched Short Message Mobile Terminated
DNS	Domain Name System
ENUM	Electronic NUmber Mapping
FQDN	Fully Qualified Domain Name
GW	Gateway
HLR	Home Location Register
HRPD	High Rate Packet Data
HSS	Home Subscriber Server
IMS	IP Multimedia Subsystem
IMSI	International Mobile Subscriber Identity
IP	Internet Protocol
ISM-MO	IMS Short Message Mobile Originated
ISM-MT	IMS Short Message Mobile Terminated
I-CSCF	Interrogating-CSCF
MAP	Mobile Application Part
MC	Message Center
MDN	Mobile Directory Number

MMD	Multimedia Domain
MS	Mobile Station
MSC	Mobile Switching Center
MSID	Mobile Station Identifier
P-CSCF	Proxy-CSCF
PNA	Diameter Push-Notification-Answer
PNR	Diameter Push-Notification-Request
SIP	Session Initiation Protocol
SME	Short Message Entity
SMS	Short Message Service
SMS-GW	SMS Gateway
SNA	Diameter Subscribe-Notification-Answer
SNR	Diameter Subscribe-Notification-Request
SPT	Service Point Triggers
S-CSCF	Serving-CSCF
UDA	Diameter User-Data-Answer
UDR	Diameter User-Data-Request
UE	User Equipment
URI	Uniform Resource Identifier
VLR	Visitor Location Register
WLAN	Wireless Local Area Network

3.2   Definitions

Circuit Switched Short Message Mobile Originated (CSM-MO)

An SMS service supporting the submission of a short message by an MS that is 1x CS-attached to the SMS-GW, and supporting a corresponding delivery acknowledgement.

Circuit Switched Short Message Mobile Terminated (CSM-MT)

An SMS service supporting the delivery of a short message by an SMS-GW to an MS that is 1x CS-attached, and supporting a corresponding delivery acknowledgement.

IMS Short Message Mobile Originated (ISM-MO)

An SMS-over-IMS service supporting the submission of a short message to an SMS-GW by an MS that is currently IMS-attached, and supporting a corresponding delivery acknowledgement.

IMS Short Message Mobile Terminated (ISM-MT)

An SMS-over-IMS service supporting the delivery of a short message by the SMS-GW to an MS that is currently IMS-attached, and supporting a corresponding delivery acknowledgement.

SMS message

Short message as defined in [C.S0015] that may be conveyed over IMS or over 1x CS.

Note: Currently the scope of this document is restricted to binary-encapsulated SMS.

SMS-GW

An entity that stores and forwards SMS messages to and from an SME that is either IMS registered and or 1x CS registered.

For the purpose of the present document, the following terms and definitions given in [MAP] apply:

- MC
- SME

4   Assumptions

The assumptions in support of delivery of SMS messages over IMS network or 1x CS network are:

1. The architecture as defined in section 5.1 supports Circuit Switched Short Message Mobile Originated (CSM-MO).

2. The architecture as defined in section 5.1 supports Circuit Switched Short Message Mobile Terminated (CSM-MT).

3. The architecture as defined in section 5.1 supports IMS Short Message Mobile Originated (ISM-MO).

4. The architecture as defined in section 5.1 supports IMS Short Message Mobile Terminated (ISM-MT).

5. It is possible for an SME, that is only IMS attached, only 1x CS attached, or simultaneously IMS and 1x CS attached, to send an SMS message.

6. It is possible for an SME, that is only IMS attached, only 1x CS attached, or simultaneously IMS and 1x CS attached, to receive an SMS message.

7. It is possible for an SMS-GW to receive an SMS message from an SME that is either only IMS attached, only 1x CS attached, or simultaneously IMS and 1x CS attached.

8. It is possible for an SMS-GW to send an SMS message to an SME that is either only IMS attached, only 1x CS attached, or simultaneously IMS and 1x CS attached.

9. The SMS messages destined for a given SME are delivered to the same SME irrespective whether the SMS message was delivered over the IMS (ISM-MT) or the circuit connection (CSM-MT).

10. When the SME originating an SMS message requests a delivery confirmation, an SMS delivery acknowledgement is returned to the originating SME.

11. When the SME is simultaneously IMS attached and 1x CS attached, the domain to use for sending the SMS message by the SME is based on operator policy and user preference.

12. When the SME is simultaneously IMS attached and 1x CS attached, the domain to use to deliver the SMS message is based on operator policy and user preference.

13. The SMS-GW includes the MC functionality in addition to the functionality defined in this document.

14. It is possible for an SMS-GW to send SMS messages to another Message Center (MC)/Short Message Service Gateway (SMS-GW) over the circuit switched network that supports the [MAP] protocol.

15. It is possible for MC/SMS-GW to send SMS messages to another SMS-GW over an IMS network.

16. The terminating SMS-GW does not send multiple simultaneous SMS messages to an SME. The terminating SMS-GW has to receive the acknowledgement that the SMS message was received by the SME prior to sending the next SMS messages to the SME. Multiple simultaneous SMS messages destined for an SME are buffered at the terminating SMS-GW.

17. The originating SME does not originate multiple simultaneous SMS messages. The originating SME has to receive the acknowledgement that the SMS message was received by the originating SMS-GW prior to sending the next SMS messages to the originating SMS-GW.

18. When SMS messages are transferred over the IMS, existing services that use SMS service functionality are not degraded.

19. It is possible to support origination and reception of SMS messages via WLAN or HRPD or both.

20. For this release of the document, the MDN that identifies the SMS subscriber is also incorporated into the tel URI that identifies the IMS subscription of the SMS subscriber. Hence, the same E.164 number is incorporated into the tel URI and MDN.

21. The SMS subscriber experience is consistent with the SMS and IMS service expectations.

5 Reference Architecture and Interfaces

5.1 SMS over IMS Architecture

The end-to-end SMS architecture assumes a segmented model. There are three distinct transport segments as depicted in Figure 5.1 (usage of the MAP on these segments is not shown).
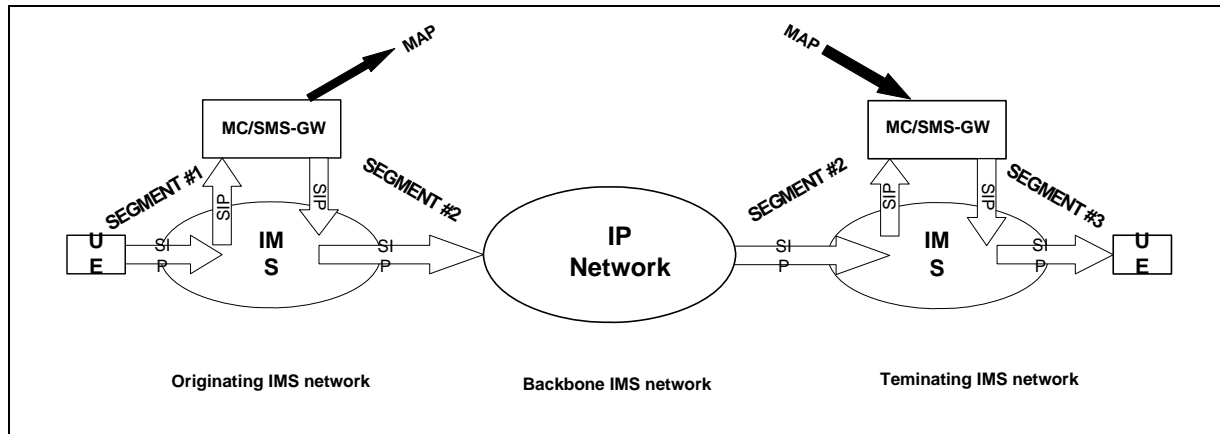
Figure 5.1 **SMS over IMS Architecture**

For the end-to-end IMS architecture, each segment is an IMS segment. However, the general architecture may employ non-IMS transport on any segment. For the end-to-end IMS architecture, the originating segment (Segment #1) is used by the sender of the SMS messages to send the SMS message to the originating MC/SMS-GW. The backbone network segment (Segment #2) is used by the originating MC/SMS-GW to forward the SMS message to the terminating MC/SMS-GW. The terminating access IMS transport segment (Segment #3) is used by the terminating MC/SMS-GW to deliver the SMS message to the receiver of the SMS messages. For the end-to-end IMS architecture, the originating MC/SMS-GW and the terminating MC/SMS-GW behave as the B2BUAs.

There are two different MC and SMS-GW architectures that may support the transport of SMS messages over the IMS. The first architecture separates the MC and SMS-GW functions and incorporates them into the respective MC and SMS-GW entities. The second architecture integrates the MC and SMS-GW functions into a single entity, i.e. the MC/SMS-GW (see Figure 5.2).

This release of this document specifies only the interactions and signaling flows for an integrated MC/SMS-GW architecture. In the rest of the document, the combined entity (MC and SMS-GW) is referred to as SMS-GW.

Figure 5.2 illustrates the SMS signaling reference architecture and associated interfaces for the integrated MC/SMS-GW architecture.
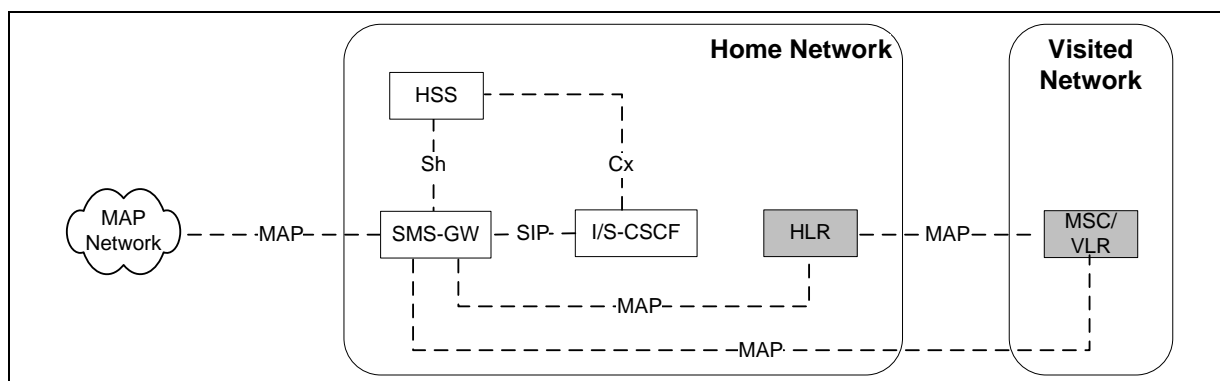
Figure 5.2 **Signaling Reference Architecture**

5.2   Functional entities

5.2.1   Short Message Service Gateway (SMS-GW)

The SMS-GW provides service of storing and forwarding SMS messages to and from an SME that is either IMS registered and/or 1x CS registered. The general functions of the SMS-GW are:

- to connect to the HLR using established MAP protocols and to acquire the UE's MSID and the SMS address;

- to connect to MSC/VLR using established MAP protocols and to receive Short Message and forward Short Message to MSC/VLR;

- to act as an Application Server towards the IMS core;

- to optionally connect to HSS using Diameter protocol Sh interface and to acquire the UE's registration status and S-CSCF name;

- to optionally perform IMS 3rd party registration;

- to acquire and maintain knowledge of the association between the MDN, MSID and the address of the S-CSCF serving the UE;

- to perform selection to deliver the SMS message over IMS or MAP;

- to map the recipient's address from a MDN/MSID to TEL URI format for IMS network delivery;

- to convey the SMS message to IMS network using SIP MESSAGE and to encapsulate binary encoded SMS transport Layer and Teleservice Layer as defined in [C.S0015] in the body of SIP MESSAGE.

5.3   Interfaces

- SMS-GW / S-CSCF (ISC)

The SMS-GW communicates with S-CSCF via an ISC SIP signaling interface.

- SMS-GW / HSS (Sh)

The SMS-GW interfaces to the HSS via an Sh interface [MMD Part-10], to obtain subscriber's registration status and S-CSCF's name.

- SMS-GW / HLR (MAP)

Serving as an MC, the SMS-GW interfaces to the 1x CS HLR using MAP in order to obtain subscriber's SMS address.

- SMS-GW / MSC (MAP)

Serving as an MC, the SMS-GW interfaces to the 1x CS MSC using MAP in order to receive short messages from MSC or send short messages to MSC.

6   Signaling Flows for SMS

This section illustrates the signaling flows pertaining to the SMS registration, SMS delivery, and SMS origination procedures.

If a mobile is registered in both 1x CS and IMS networks, the SMS-GW decides which network to use for initial SMS delivery attempt to the mobile. The SMS-GW selects the delivery network based on either the SMS-GW local configuration information (i.e. operator's preference), or the mobile user provisioning information (i.e. subscriber's preference). If both local configuration and user provisioning information are supported by the operator, the SMS-GW bases the delivery network selection on the user provisioning information (i.e. subscriber's preference). In case the initial preferred delivery attempt fails, the SMS-GW attempts delivery via the alternate network. The scenarios described below illustrate the SMS-GW logic based on local configuration.

6.1   Registration Procedures

6.1.1   SMS-GW IMS 3rd Party Registration – Success Scenario

Figure 6.1 illustrates the SMS-GW IMS 3rd Party Registration call flow.
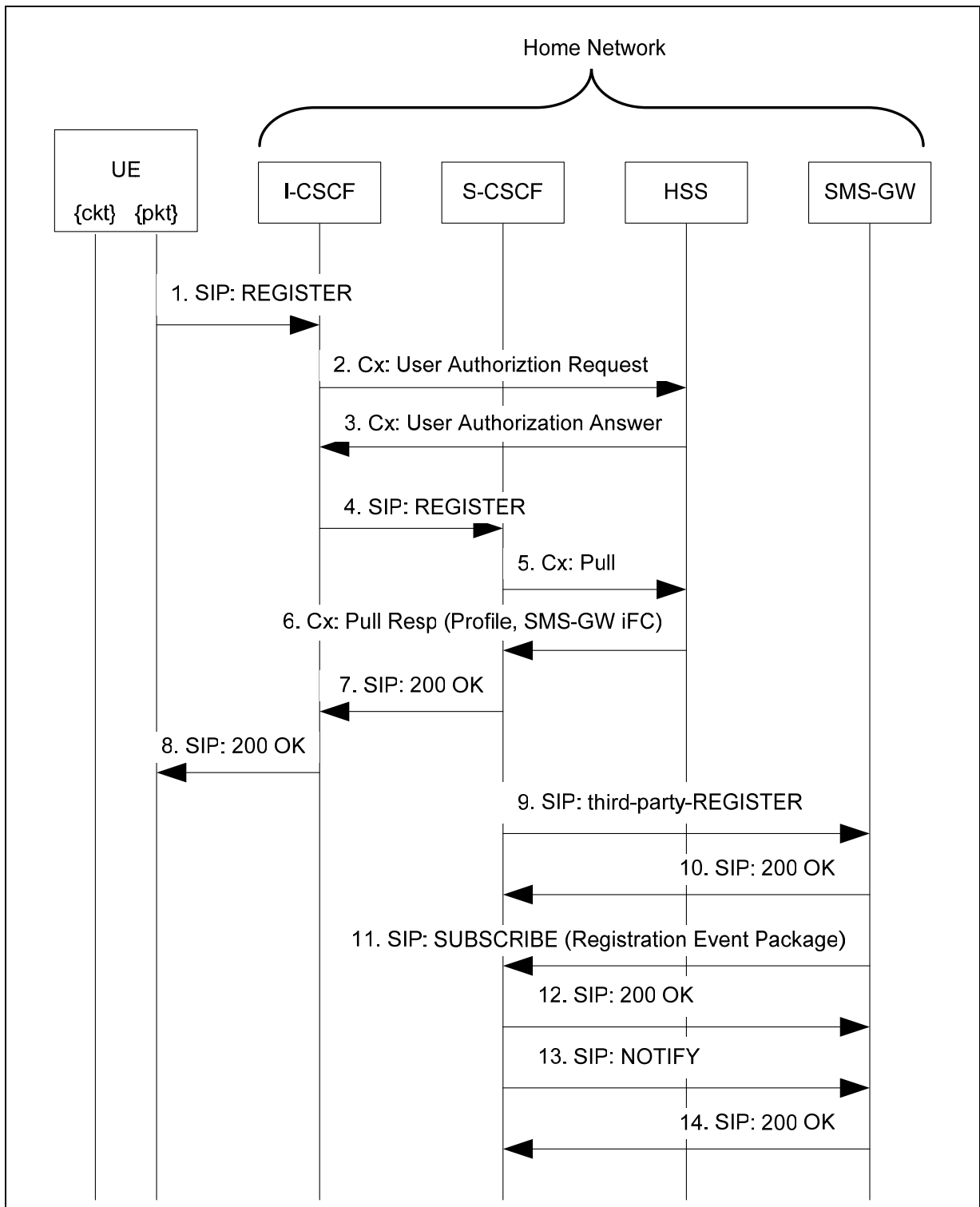
Figure 6.1 SMS-GW IMS 3rd Party Registration – Success Scenario

1. The UE sends a SIP REGISTER to the I-CSCF via the P-CSCF (not shown for brevity).

2. The I-CSCF queries the HSS to get the address of the S-CSCF.

3. The HSS returns the address of the S-CSCF for this user.

4. The I-CSCF sends the SIP REGISTER to the S-CSCF.

5. The S-CSCF queries the HSS to obtain the subscriber information.

6. The HSS returns the subscriber's profile and initial filter criteria (iFC). If the UE/subscriber has subscription to the SMS-over-IMS service, the initial filter criteria will contain a trigger for performing third-party registration to the SMS-GW. The ServiceInfo element (see [MMD Part-5]) in the iFC can contain the MDN of the UE.

7. The S-CSCF returns a SIP 200 OK to the I-CSCF.

8. The I-CSCF returns the SIP 200 OK to the UE via the P-CSCF (not shown for brevity).

9. Based on the iFC, the S-CSCF sends a SIP REGISTER to the SMS-GW to do 3rd party registration. If the iFC contained a ServiceInfo element, the S-CSCF includes the information in the <service-info> XML element in the body of the SIP REGISTER.

10. The SMS-GW returns a SIP 200 OK to the S-CSCF. If the SIP REGISTER contains a body with the <service-info> XML element, the SMS-GW extracts the MDN associated with the SIP URI of UE from the XML element. The rest of the steps may be skipped by the SMS-GW.

11. The SMS-GW sends a SIP SUBSRCIBE to the S-CSCF to subscribe to the Registration Event Package.

12. The S-CSCF responds with a SIP 200 OK.

13. The S-CSCF sends a SIP NOTIFY to the SMS-GW.

14. The SMS-GW responds with a SIP 200 OK.

6.1.2   Domain Availability Notification

This procedure is used by the UE to send an indication to the SMS-GW that it is currently attached only to the 1x CS domain.

When a UE was last IMS registered via a HRPD/WLAN air-interface and the UE detects the loss of the HRPD/WLAN air-interface and 1x CS air-interface is available, the UE registers (if necessary) with the 1x CS network and sends an SMS addressed to the E.164 number associated with the SMS-GW PSI.

The call flow below describes how the SMS message containing the 1x CS-only attachment information is delivered to the SMS-GW.

NOTE: this is an optional feature based on operator policy.
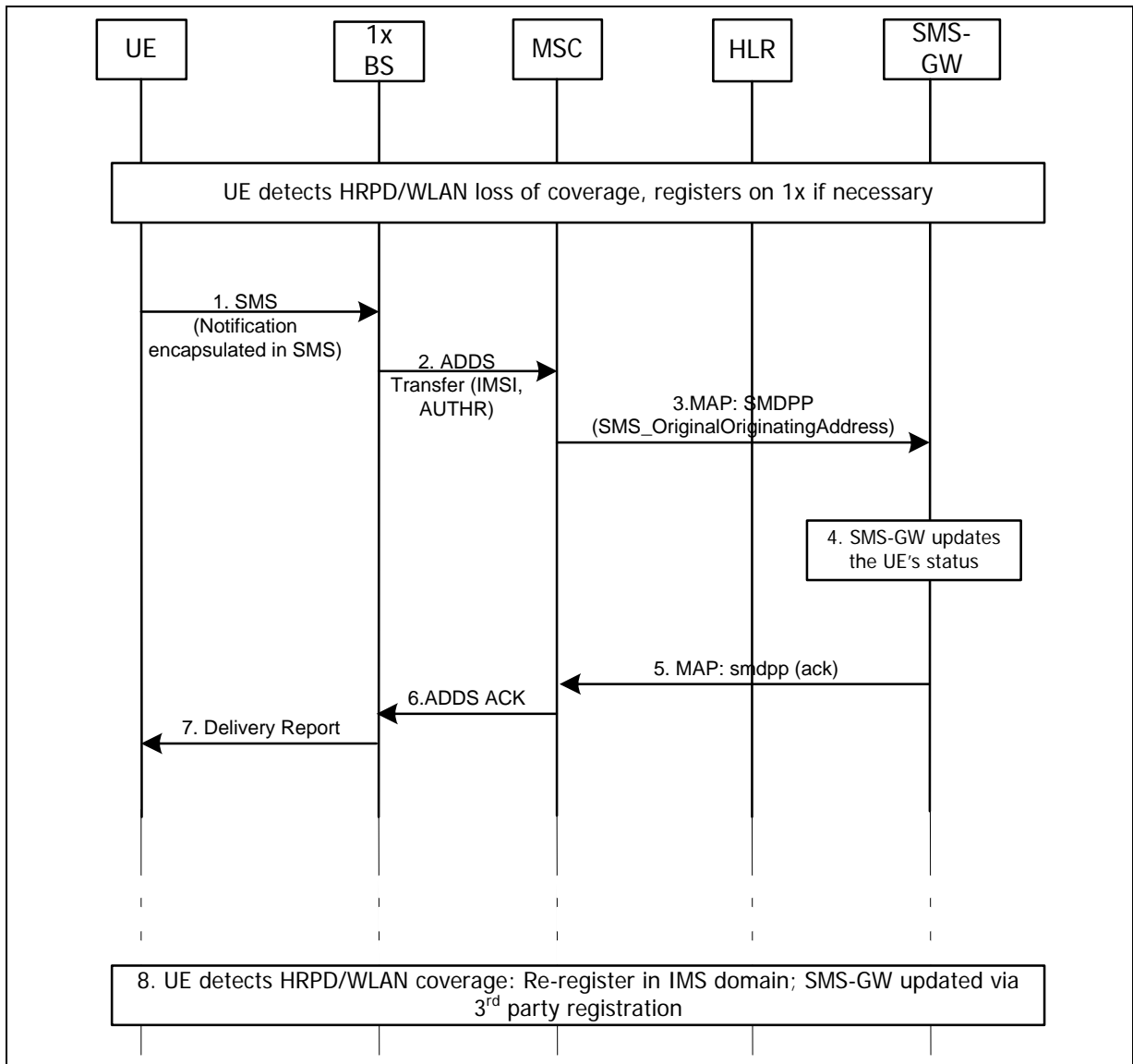
Figure 6.2 **UE Initiated Notification after 1x CS Registration**

1. On detecting HRPD/WLAN loss of coverage, the UE registers on 1x CS if necessary. The UE encapsulates the notification update in an SMS message addressed to the SMS-GW (i.e., address to E.164 number associated with the SMS-GW PSI, which is provisioned at the UE).

2. An ADDS Transfer message is sent from the 1x BS to the Visited MSC.

3. The Visited MSC forwards the SMS message to the SMS-GW.

4. On receipt of an SMS message, the SMS-GW updates state of the UE in order to deliver all future SMS messages to the UE over 1x CS.

5. The SMS-GW responds to the delivered SMS message with a positive acknowledgement.

6-7.   The positive acknowledgement is forwarded through the MC/MSC to the originating UE.

8.   When the HRPD/WLAN becomes available again, the UE performs an IMS re-registration and the SMS-GW is updated via 3rd party registration (as described in Section 6.1.1) so that future SMS messages can be delivered over IMS.

6.2   SMS Delivery Procedures

This section assumes that the terminating SMS-GW receives an SMS message from an originating SMS-GW via MAP. However it is not precluded that the terminating SMS-GW can receive an SMS message from an originating SMS-GW via SIP.

6.2.1   Initial IMS Delivery Attempt: Success Scenario

Figure 6.3 illustrates a signaling flow for the scenario where a terminal that is SIP registered and tuned to HRPD, receives an SMS message.
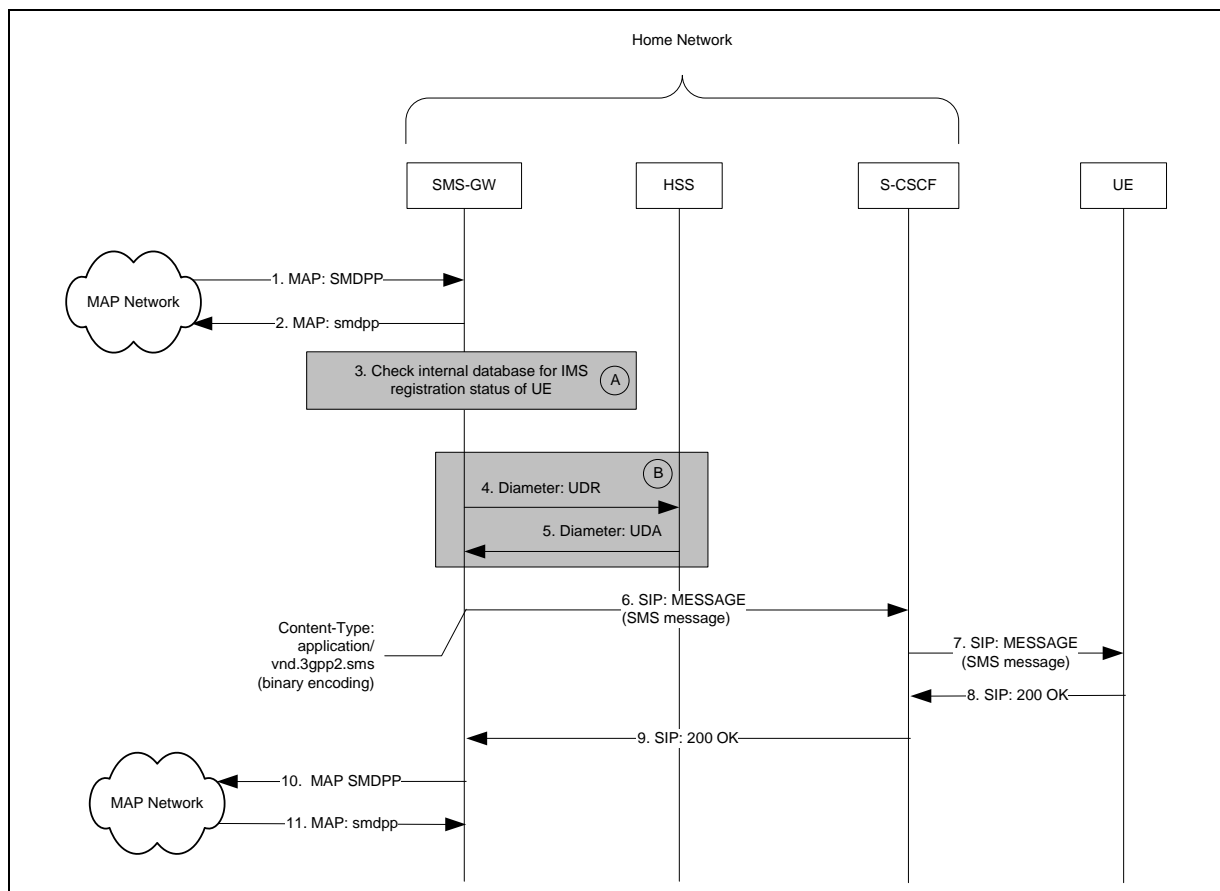
Figure 6.3 **Initial IMS Delivery Attempt: Success Scenario**

Preconditions:

▪ The SMS-GW is provisioned to prefer SMS delivery via IMS.

▪ The UE is IMS registered.

1. The SMS-GW for the UE receives a MAP SMDPP message for the UE from an originating SMS-GW. The originating SMS-GW is not shown for brevity.

2. The SMS-GW responds by sending a MAP smdpp message back to the originating SMS-GW.

3. Option A: If the SMS-GW receives IMS 3rd party registrations or Registration Event notifications from the S-CSCF, then it checks its internal data base and determines that the UE is IMS registered.

4. Option B: If the SMS-GW does not receive IMS 3rd party registrations or Registration Event notifications from the S-CSCF, then it sends a Diameter User-Data-Request (UDR) message to the HSS to determine whether or not the UE is IMS registered. The SMS-GW queries the HSS using the MDN of the UE received in step 1.

5. Option B: The HSS responds by sending a Diameter User-Data-Answer (UDA) message to the SMS-GW indicating that the UE is IMS registered. If the UE is IMS registered, the HSS also returns the UE's S-CSCF address.

6. The SMS-GW sends a SIP MESSAGE to the UE's S-CSCF containing the SMS message received in step 1. The Content-Type value associated with the SIP MESSAGE shall be "application/vnd.3gpp2.sms" [MIME-SMS]. The payload of the SIP MESSAGE shall contain a binary encoded SMS transport layer SMS Point-to-Point message [C.S0015]. The SIP MESSAGE headers To and From shall be set to the TEL-URI format.

7. The S-CSCF forwards the SIP MESSAGE to the UE via the UE's P-CSCF. The UE's P-CSCF is not shown for brevity.

8. The UE responds by sending a SIP 200 OK back to the SMS-GW via the UE's P-CSCF and S-CSCF. The UE's P-CSCF is not shown for brevity.

9. The UE's S-CSCF forwards the SIP 200 OK to the SMS-GW.

10. If required in the original MAP SMDPP message, the SMS-GW generates a MAP SMDPP message to the originating SMS-GW to inform it about the delivery status.

11. The originating SMS-GW responds by sending a MAP smdpp message back to SMS-GW.

6.2.2 Initial IMS Delivery Attempt, Not IMS Registered: 1x CS Delivery Success

Figure 6.4 illustrates a signaling flow for the scenario where a terminal that is not IMS registered, but 1x CS registered and tuned to 1x CS, receives an SMS message.

Figure 6.4 **Initial IMS Delivery Attempt, Not IMS Registered: 1x CS Delivery Success**

Preconditions:

- The SMS-GW is provisioned to prefer SMS delivery via IMS.

- The UE is not IMS registered.

1. The SMS-GW for the UE receives a MAP SMDPP message for the UE from an originating SMS-GW. The originating SMS-GW is not shown for brevity.

2. The SMS-GW responds by sending a MAP smdpp message back to the sender of the MAP SMDPP message.

3. Option A: If the SMS-GW receives IMS 3rd party registrations or Registration Event notifications from the S-CSCF, then it checks its internal data base and determines that the UE is not IMS registered.

4. Option B: If the SMS-GW does not receive IMS 3rd party registrations or Registration Event notifications from the S-CSCF, then it sends a Diameter UDR message to the HSS to determine whether or not the UE is IMS registered. The SMS-GW queries the HSS using the MDN of the UE received in step 1.

5. Option B: The HSS responds by sending a Diameter UDA message to the SMS-GW indicating that the UE is not IMS registered.

6. The SMS-GW sends a MAP SMSREQ to the HLR containing the UE's MDN in order to determine the UE's current routing information and retrieve the UE's MSID information. The SMS_NotificationIndicator in the MAP SMSREQ is set to "Notify when available".

7.   The HLR sends a MAP smsreq message back to the SMS-GW containing the UE's MSID and SMS address (i.e. MSC/VLR address).

8.   The SMS-GW sends an SMDPP message containing the UE's MSID to the MSC identified by the SMS address (i.e. MSC/VLR address).

9.   The SMS message is delivered to the UE on 1x CS and a Layer 2 Ack is received.

10.   The MSC for the UE sends a MAP smdpp message back to the SMS-GW.

11.   If required in the original MAP SMDPP message, the SMS-GW generates a MAP SMDPP message to the originating SMS-GW to inform it about the delivery status.

12.   The originating SMS-GW responds by sending a MAP smdpp message back to SMS-GW.

6.2.3   Initial IMS Delivery Attempt, IMS Registered: 1x CS Delivery Success

Figure 6.5 illustrates a signaling flow for the scenario where a terminal that is IMS registered, but also 1x CS registered and actually tuned to 1x CS, receives an SMS message.
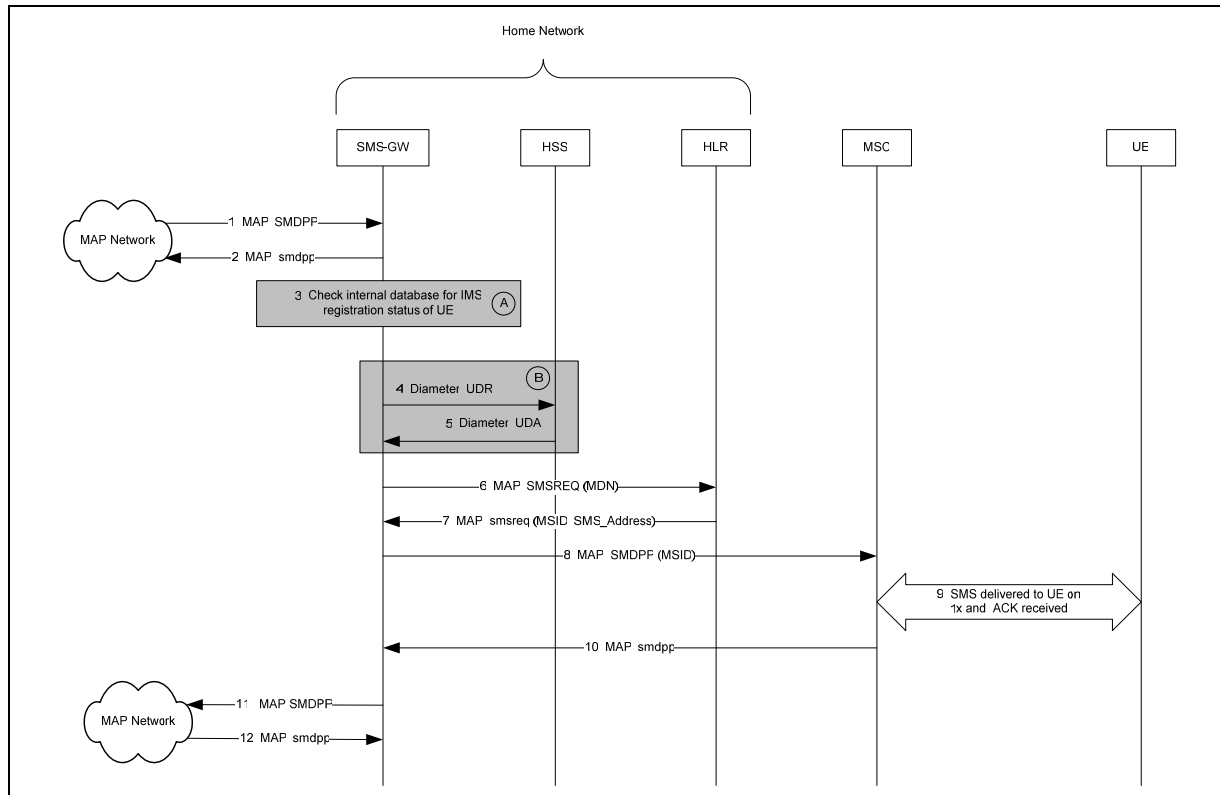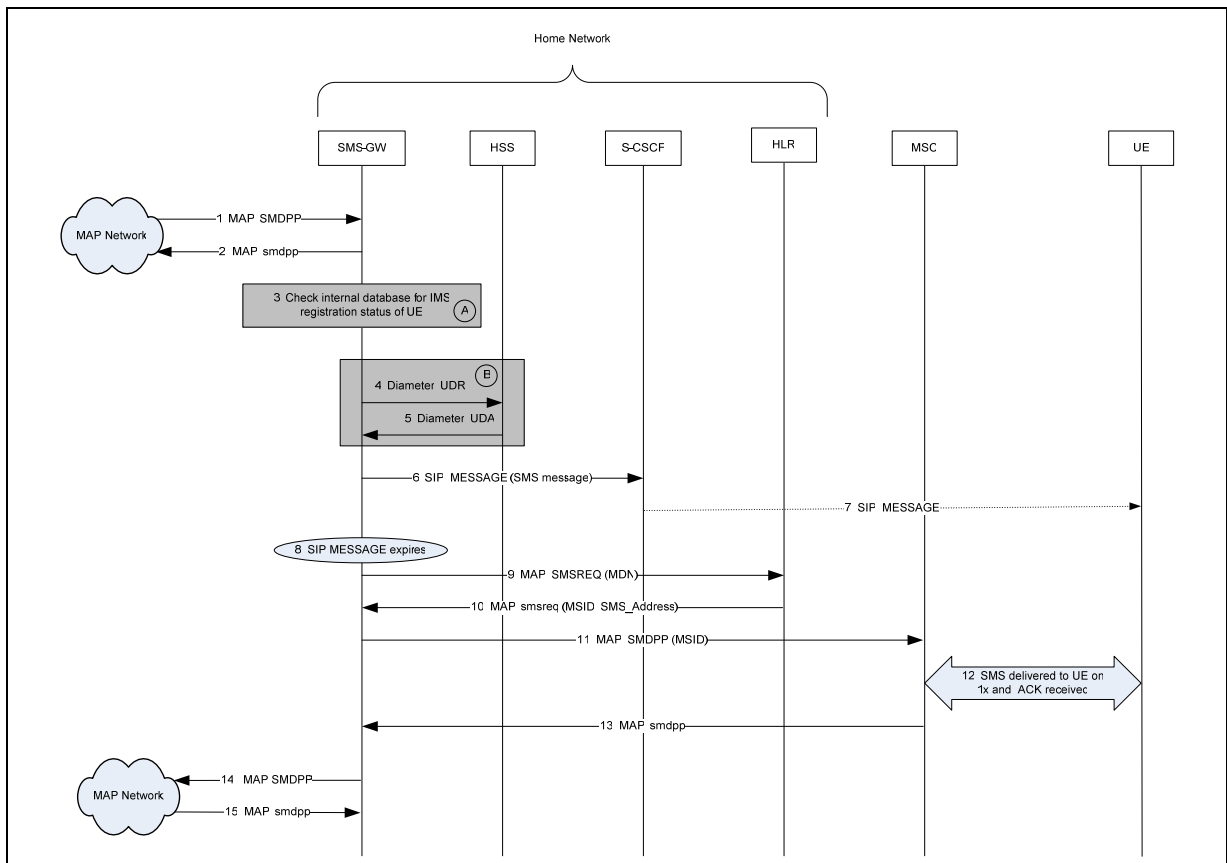

***Figure 6.5* Initial IMS Delivery Attempt, IMS Registered: 1x CS Delivery Success**

Preconditions:

▪   The SMS-GW is provisioned to prefer SMS delivery via IMS.

▪   The UE is IMS registered.

■   The UE is 1x CS registered and attached to 1x CS.

1.   The SMS-GW for the UE receives a MAP SMDPP message for UE from an originating SMS-GW. The originating SMS-GW is not shown for brevity.

2.   The SMS-GW responds by sending a MAP smdpp message back to the originating SMS-GW.

3.   Option A: If the SMS-GW receives IMS 3rd party registrations or Registration Event notifications from the S-CSCF, then it checks its internal data base and determines that the UE is IMS registered.

4.   Option B: If the SMS-GW does not receive IMS 3rd party registrations or Registration Event notifications from the S-CSCF, then it sends a Diameter UDR message to the HSS to determine whether or not the UE is IMS registered. The SMS-GW queries the HSS using the MDN of the UE received in step 1.

5.   Option B: The HSS responds by sending a Diameter UDA message to the SMS-GW indicating that the UE is IMS registered. If the UE is IMS registered, the HSS also returns the UE's S-CSCF address.

6.   The SMS-GW sends a SIP MESSAGE to the UE's S-CSCF containing the SMS message received in step 1.

7.   The S-CSCF forwards the SIP MESSAGE to the UE via the UE's P-CSCF. The UE's P-CSCF is not shown for brevity.

8.   The SMS-GW determines that the SIP MESSAGE has expired or failed to deliver. How does SMS-GW determine is outside the scope of this document.

9.   When the SIP MESSAGE expires or fails to deliver, the SMS-GW sends a MAP SMSREQ to the HLR containing the UE's MDN in order to determine the UE's current routing information and retrieve The UE's MSID information. The SMS_NotificationIndicator in the MAP SMSREQ is set to "Notify when available".

10.   The HLR sends a MAP smsreq back to the SMS-GW containing the UE's MSID and SMS address (i.e. MSC/VLR address).

11.   The SMS-GW sends a MAP SMDPP message containing the UE's MSID to the MSC identified by the SMS address (i.e. MSC/VLR address).

12.   The SMS message is delivered to UE on 1x CS and a Layer 2 Ack is received.

13.   The MSC for the UE sends a MAP smdpp message back to the SMS-GW.

14.   If required in the original MAP SMDPP message, the SMS-GW generates a MAP SMDPP message to the originating SMS-GW to inform it about the delivery status.

15.   The originating SMS-GW responds by sending a MAP smdpp message back to SMS-GW.

6.2.4   Initial IMS Delivery Attempt, Not IMS Registered, Not 1x CS Registered, UE Availability Notification through HSS or 3rd Party Registration: IMS Delivery Success

Figure 6.6 illustrates a signaling flow for the scenario where a terminal that is initially neither IMS nor 1x CS registered. SMS-GW subscribes to HSS for notification and when the UE registers over IMS, the SMS message is successfully delivered over IMS.

Figure 6.6 Initial IMS Delivery Attempt, Not IMS Registered, Not 1x CS Registered, UE Availability Notification through HSS or 3rd Party Registration: IMS Delivery Success
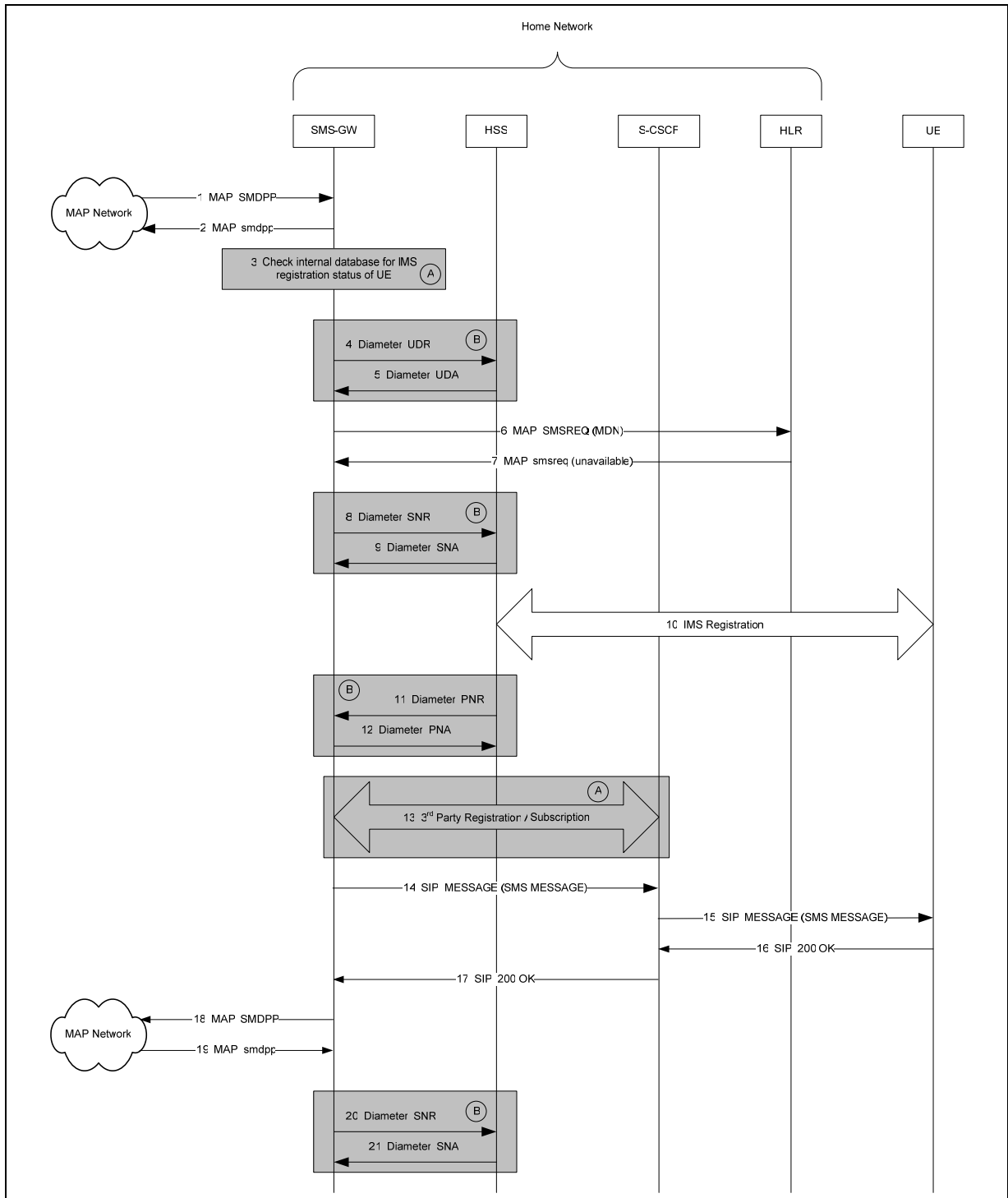
Preconditions:

- The SMS-GW is provisioned to prefer SMS delivery via IMS.

- The UE is not IMS registered.

- The UE is not 1x CS registered.

1. The SMS-GW for the UE receives a MAP SMDPP message for the UE from an originating SMS-GW. The originating SMS-GW is not shown for brevity.

2. The SMS-GW responds by sending a MAP smdpp message back to the originating SMS-GW.

3. Option A: If the SMS-GW receives IMS 3rd party registrations or Registration Event notifications from the S-CSCF, then it checks its internal data base and determines that the UE is not IMS registered.

4. Option B: If the SMS-GW does not receive IMS 3rd party registrations or Registration Event notifications from the S-CSCF, then it sends a Diameter UDR message to the HSS to determine whether or not the UE is IMS registered. The SMS-GW queries the HSS using the MDN of the UE received in step 1.

5. Option B: The HSS responds by sending a UDA message to the SMS-GW indicating that the UE is not IMS registered.

6. The SMS-GW sends an MAP SMSREQ to the HLR containing the UE's MDN in order to determine the UE's current routing information and retrieve the UE's MSID information. The SMS_NotificationIndicator in the MAP SMSREQ is set to "Notify when available". The SMS_NotificationIndicator in the MAP SMSREQ is set to "Notify when available".

7. The HLR sends an MAP smsreq back to the SMS-GW indicating the UE is currently unavailable in the 1x CS Network.

8. Option B: If the SMS-GW does not receive IMS 3rd party registrations or Registration Event notifications from the S-CSCF, then it sends a Diameter SNR to the HSS, indicating that it should be notified when the UE registers and is assigned an S-CSCF.

9. Option B: The HSS sends a SNA response to the SMS-GW.

10. Later, the UE registers with the S-CSCF and HSS.

11. Option B: If the HSS received an SNR in step 7, then the HSS sends a Diameter Push-Notification-Request (PNR) message to the SMS-GW including the address of the S-CSCF assigned to the UE.

12. Option B: The SMS-GW sends a Diameter Push-Notification-Answer (PNA) back to the HSS.

13. Option A: The S-CSCF optionally does a 3rd party registration with the SMS-GW.

14. The SMS-GW sends a SIP MESSAGE to the UE's S-CSCF containing the SMS message received in step 1. The Content-Type value associated with the SIP MESSAGE shall be "application/vnd.3gpp2.sms". The payload of the SIP MESSAGE shall contain a binary encoded SMS transport layer SMS Point-to-Point message [C.S0015]. The fields of To/From of SIP MESSAGE shall be set to TEL-URL format.

15. The S-CSCF forwards the SIP MESSAGE to the UE via the UE's P-CSCF. The UE's P-CSCF is not shown for brevity.

16. The UE responds by sending a SIP 200 OK back to the SMS-GW via the UE's P-CSCF and S-CSCF. The UE's P-CSCF is not shown for brevity.

17.   The UE's S-CSCF forwards the SIP 200 OK to the SMS-GW.

18.   If required in the original MAP SMDPP message, the SMS-GW generates a MAP SMDPP message to the originating SMS-GW to inform it about the delivery status.

19.   The originating SMS-GW responds by sending a MAP smdpp message back to SMS-GW.

20.   Option B: If the SMS GW sent an SNR to the HSS in step 7, then the SMS-GW sends a Diameter SNR to the HSS to unsubscribe the notification.

21.   Option B: The HSS responds with a Diameter SNA to the SMS-GW.

6.2.5   Initial IMS Delivery Attempt, Not IMS Registered, Not 1x CS Registered, HSS Subscription for Notification: 1x CS Delivery Success

Figure 6.7 illustrates a signaling flow for the scenario where a terminal that is initially neither IMS nor 1x CS registered, the SMS_NotificationIndicator in the MAP SMSREQ message to HLR is set to indicate that notify when UE is available, SMS-GW also subscribes to HSS for notification and SMS message is successfully delivered over 1x CS.
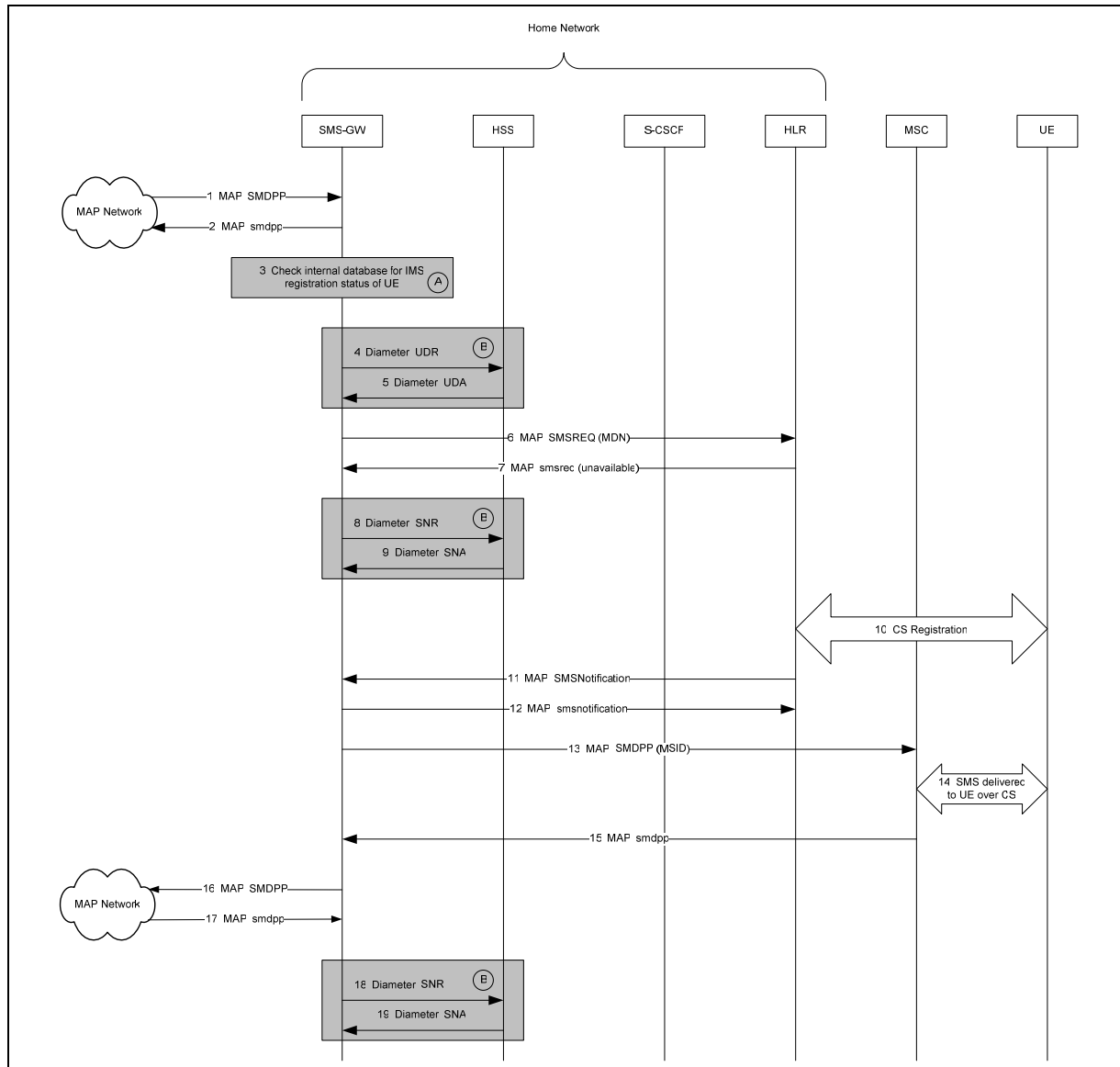
***Figure 6.7* Initial IMS Delivery Attempt, Not IMS Registered, Not 1x CS Registered, HSS Notification Subscription: 1x CS Delivery Success**

Preconditions:

- The SMS-GW is provisioned to prefer SMS delivery via IMS.

- The UE is not IMS registered.

- The UE is not 1x CS registered.

1. The SMS-GW for the UE receives a MAP SMDPP message for the UE from an originating SMS-GW. The originating SMS-GW is not shown for brevity.

2. SMS-GW responds by sending a MAP smdpp message back to the originating SMS-GW.

3. Option A: If the SMS-GW receives IMS 3rd party registrations or Registration Event notifications from the S-CSCF, then it checks its internal data base and determines that the UE is not IMS registered.

4. Option B: If the SMS-GW does not receive IMS 3rd party registrations or Registration Event notifications from the S-CSCF, then it sends a Diameter UDR message to the HSS to determine whether or not the UE is IMS registered. The SMS-GW queries the HSS using the MDN of the UE received in step 1.

5. Option B: The HSS responds by sending a Diameter UDA message to the SMS-GW indicating that the UE is not IMS registered.

6. The SMS-GW sends an MAP SMSREQ to the HLR containing the UE's MDN in order to determine UE's current routing information and retrieve UE's MSID information. The SMS_NotificationIndicator in the MAP SMSREQ is set to "Notify when available".

7. The HLR sends an MAP smsreq back to the SMS-GW indicating the UE is currently unavailable in the 1x CS Network.

8. Option B: If the SMS-GW does not receive IMS 3rd party registrations or Registration Event notifications from the S-CSCF, then it sends a Diameter SNR to the HSS, indicating that it should be notified when UE registers and is assigned an S-CSCF.

9. Option B: The HSS sends a Diameter SNA response to the SMS-GW.

10. Later, the UE registers on the 1x CS network with the MSC and HLR.

11. The HLR sends a MAP SMSNotification message to the SMS-GW including the routing address.

12. SMS-GW responds with the MAP smsnotification message to HLR.

13. The SMS-GW sends a MAP SMDPP message containing the UE's MSID to the MSC identified by the SMS address (i.e. MSC/VLR address).

14. The SMS message is delivered to the UE on 1x CS and a Layer 2 Ack is received.

15. The MSC for the UE sends a MAP smdpp message back to the SMS-GW.

16. If required in the original MAP SMDPP message, the SMS-GW generates a MAP SMDPP message to the originating SMS-GW to inform it about the delivery status.

17. The originating SMS-GW responds by sending a MAP smdpp message back to SMS-GW.

18. Option B: If the SMS GW sent an SNR to the HSS in step 7, then the SMS-GW sends a Diameter SNR to the HSS to unsubscribe the notification.

19. Option B: The HSS responds with a Diameter SNA to the SMS-GW.

6.2.6   Initial 1x CS Delivery Attempt: Success Scenario

Figure 6.8 illustrates a signaling flow for the scenario where an SMS message is delivered to a 1x CS registered UE.
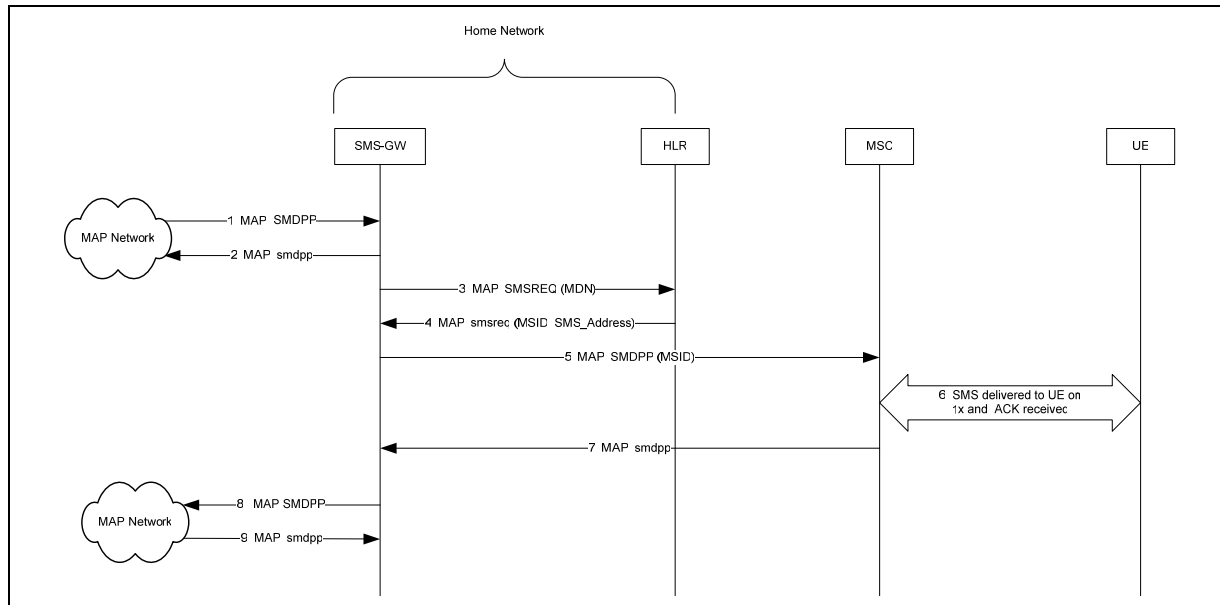
Figure 6.8 **Initial 1x CS Delivery Attempt: Success Scenario**

Preconditions:

- The SMS-GW is provisioned to prefer SMS delivery via 1x CS.

- The UE is 1x CS registered.

1. The SMS-GW for the UE receives a MAP SMDPP message for UE from an originating SMS-GW. The originating SMS-GW is not shown for brevity.

2. The SMS-GW responds by sending a MAP smdpp message back to the sender of the MAP SMDPP message.

3. The SMS-GW sends a MAP SMSREQ to the HLR containing the UE's MDN in order to determine the UE's current routing information and retrieve the UE's MSID information. The SMS_NotificationIndicator in the MAP SMSREQ is set to "Notify when available".

4. The HLR sends a MAP smsreq message back to the SMS-GW containing the UE's MSID and SMS address (i.e. MSC/VLR address).

5. The SMS-GW sends a MAP SMDPP message containing the UE's MSID to the MSC identified by the SMS address (i.e. MSC/VLR address).

6. The SMS message is delivered to UE on 1x CS and a Layer 2 Ack is received.

7. The MSC for UE sends a MAP smdpp success response message back to the SMS-GW.

8. If required in the original MAP SMDPP message, the SMS-GW generates a MAP SMDPP message to the originating SMS-GW to inform it about the delivery status.

9. The originating SMS-GW responds by sending the MAP smdpp message back to SMS-GW.

6.2.7   Initial 1x CS Delivery Attempt, Not 1x CS Registered: IMS Delivery Success

Figure 6.9 illustrates a signaling flow for the scenario where the SMS-GW is configured for initial 1x CS delivery, but the terminal not 1x CS registered, so sends the SMS over IMS.

Figure 6.9 **Initial 1x CS Delivery Attempt, Not 1x CS Registered: IMS Delivery Success**

Preconditions:

- The SMS-GW is provisioned to prefer SMS delivery via 1x CS.

- The UE is not 1x CS registered.

- The UE is IMS registered.

1. The SMS-GW for the UE receives a MAP SMDPP message for the UE from an originating SMS-GW. The originating SMS-GW is not shown for brevity.

2. The SMS-GW responds by sending a MAP smdpp message back to the sender of the MAP SMDPP message.

3. The SMS-GW sends a MAP SMSREQ to the HLR containing the UE's MDN in order to determine the UE's current routing information and retrieve the UE's MSID information. The SMS_NotificationIndicator in the MAP SMSREQ is set to "Notify when available".

4.   The HLR sends a MAP smsreq message back to the SMS-GW indicating that the UE is currently unavailable in the 1x CS network.

5.   Option A: If the SMS-GW receives IMS 3rd party registrations or Registration Event notifications from the S-CSCF, then it checks its internal data base and determines that the UE is IMS registered.

6.   Option B: If the SMS-GW does not receive IMS 3rd party registrations or Registration Event notifications from the S-CSCF, then it sends a Diameter UDR message to the HSS to verify whether or not the UE is IMS registered. The SMS-GW queries the HSS using the MDN of the UE received in step 1.

7.   Option B: The HSS responds by sending a Diameter UDA message to the SMS-GW indicating that the UE is IMS registered. The HSS also returns the UE's S-CSCF address.

8.   The SMS-GW sends a SIP MESSAGE to UE's S-CSCF containing the SMS message received in step 1. The Content-Type value associated with the SIP MESSAGE shall be "application/vnd.3gpp2.sms". The payload of the SIP MESSAGE shall contain a binary encoded SMS transport layer SMS Point-to-Point message [C.S0015]. The SIP MESSAGE headers To and From shall be set to the TEL-URI format.

9.   The S-CSCF forwards the SIP MESSAGE to the UE via the UE's P-CSCF. The UE's P-CSCF is not shown for brevity.

10. The UE responds by sending a SIP 200 OK back to the SMS-GW via the UE's P-CSCF and S-CSCF. The UE's P-CSCF is not shown for brevity.

11. The UE's S-CSCF forwards the SIP 200 OK to the SMS-GW.

12. If required in the original MAP SMDPP message, the SMS-GW generates a MAP SMDPP message to the originating SMS-GW to inform it about the delivery status.

13. The originating SMS-GW responds by sending the MAP smdpp message back to SMS-GW.

6.2.8   Initial 1x CS Delivery Attempt, 1x CS Registered: IMS Delivery Success

Figure 6.10 illustrates a signaling flow for the scenario where a terminal that is registered in both IMS and 1x CS networks, fails to receive an SMS message on 1x CS, but receives it on IMS.
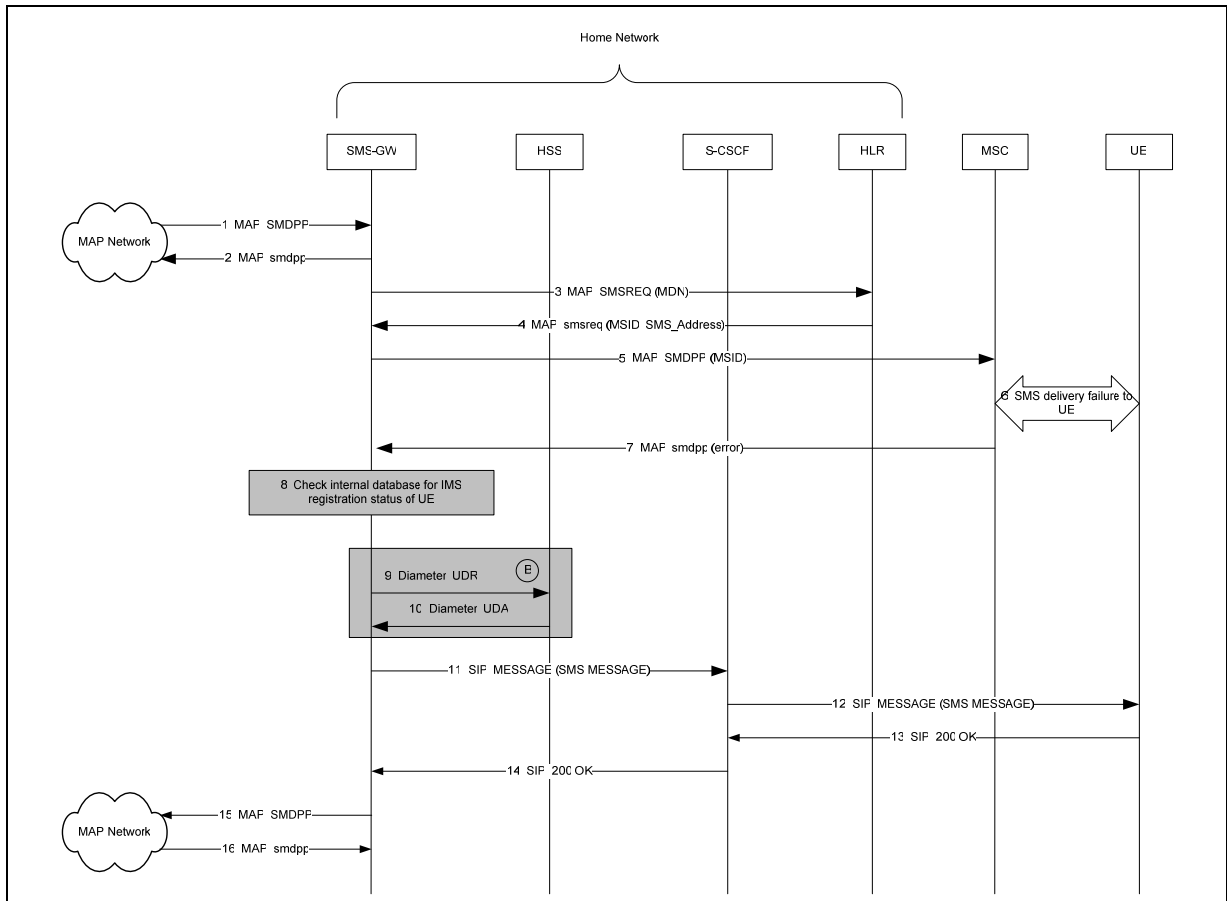
Figure 6.10   Initial 1x CS Delivery Attempt, 1x CS Registered: IMS Delivery Success
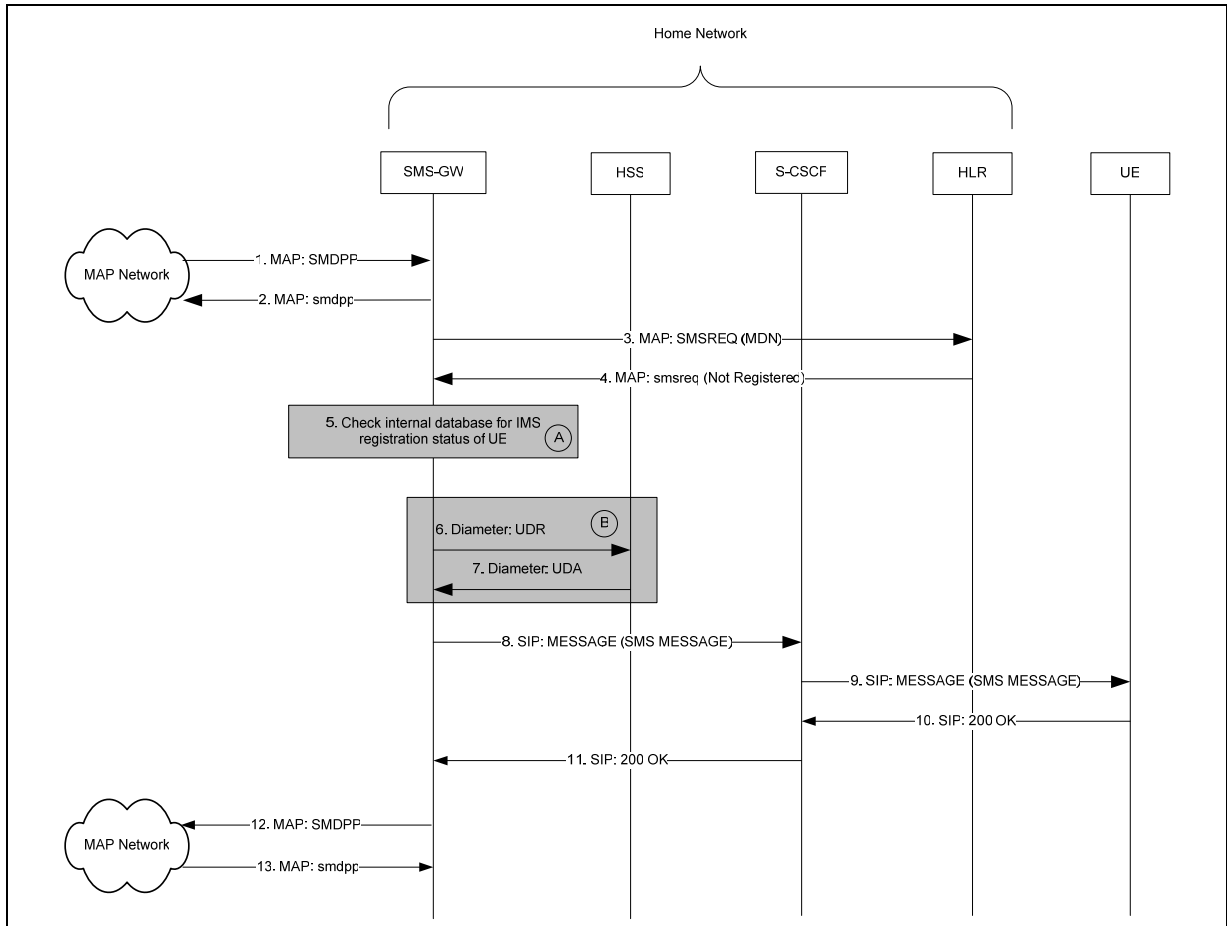
Preconditions:

- The SMS-GW is provisioned to prefer SMS delivery via 1x CS.

- The UE is 1x CS registered.

- The UE is IMS registered.

1. The SMS-GW for the UE receives a MAP SMDPP message for the UE from an originating SMS-GW. The originating SMS-GW is not shown for brevity.

2. The SMS-GW responds by sending a MAP smdpp message back to the sender of the MAP SMDPP message.

3. The SMS-GW sends a MAP SMSREQ to the HLR containing the UE's MDN in order to determine the UE's current routing information and retrieve the UE's MSID information. The SMS_NotificationIndicator in the MAP SMSREQ is set to "Notify when available".

4. The HLR sends a MAP smsreq message back to the SMS-GW containing the UE's MSID and SMS address (i.e. MSC/VLR address).

5. The SMS-GW sends a MAP SMDPP message containing the UE's MSID to the MSC identified by the SMS address (i.e. MSC/VLR address).

6. The SMS delivery to the UE on 1x CS fails.

7.   The MSC for UE sends a MAP smdpp message back to the SMS-GW. The response message contains an error code that describes the failure.

8.   Option A: If the SMS-GW receives IMS 3rd party registrations or Registration Event notifications from the S-CSCF, then it checks its internal data base and determines that the UE is IMS registered.

9.   Option B: If the SMS-GW does not receive IMS 3rd party registrations or Registration Event notifications from the S-CSCF, then it sends a Diameter UDR message to the HSS to verify whether or not the UE is IMS registered. The SMS-GW queries the HSS using the MDN of the UE received in step 1.

10. Option B: The HSS responds by sending a Diameter UDA message to the SMS-GW indicating that the UE is IMS registered. The HSS also returns the UE's S-CSCF address.

11. The SMS-GW sends a SIP MESSAGE to the UE's S-CSCF containing the SMS message received in step 1. The Content-Type value associated with the SIP MESSAGE shall be "application/vnd.3gpp2.sms". The payload of the SIP MESSAGE shall contain a binary encoded SMS transport layer SMS Point-to-Point message [C.S0015]. The SIP MESSAGE headers To and From shall be set to the TEL-URI format.

12. The S-CSCF forwards the SIP MESSAGE to the UE via the UE's P-CSCF. The UE's P-CSCF is not shown for brevity.

13. The UE responds by sending a SIP 200 OK back to the SMS-GW via the UE's P-CSCF and S-CSCF. The UE's P-CSCF is not shown for brevity.

14. The UE's S-CSCF forwards the SIP 200 OK to the SMS-GW.

15. If required in the original MAP SMDPP message, the SMS-GW generates a MAP SMDPP message to the originating SMS-GW to inform it about the delivery status.

16. The originating SMS-GW responds by sending the MAP smdpp message back to SMS-GW.

6.2.9 Initial IMS Delivery Attempt, IMS Registered, Not 1x CS Registered, No 3rd party registration, SMS-GW retries

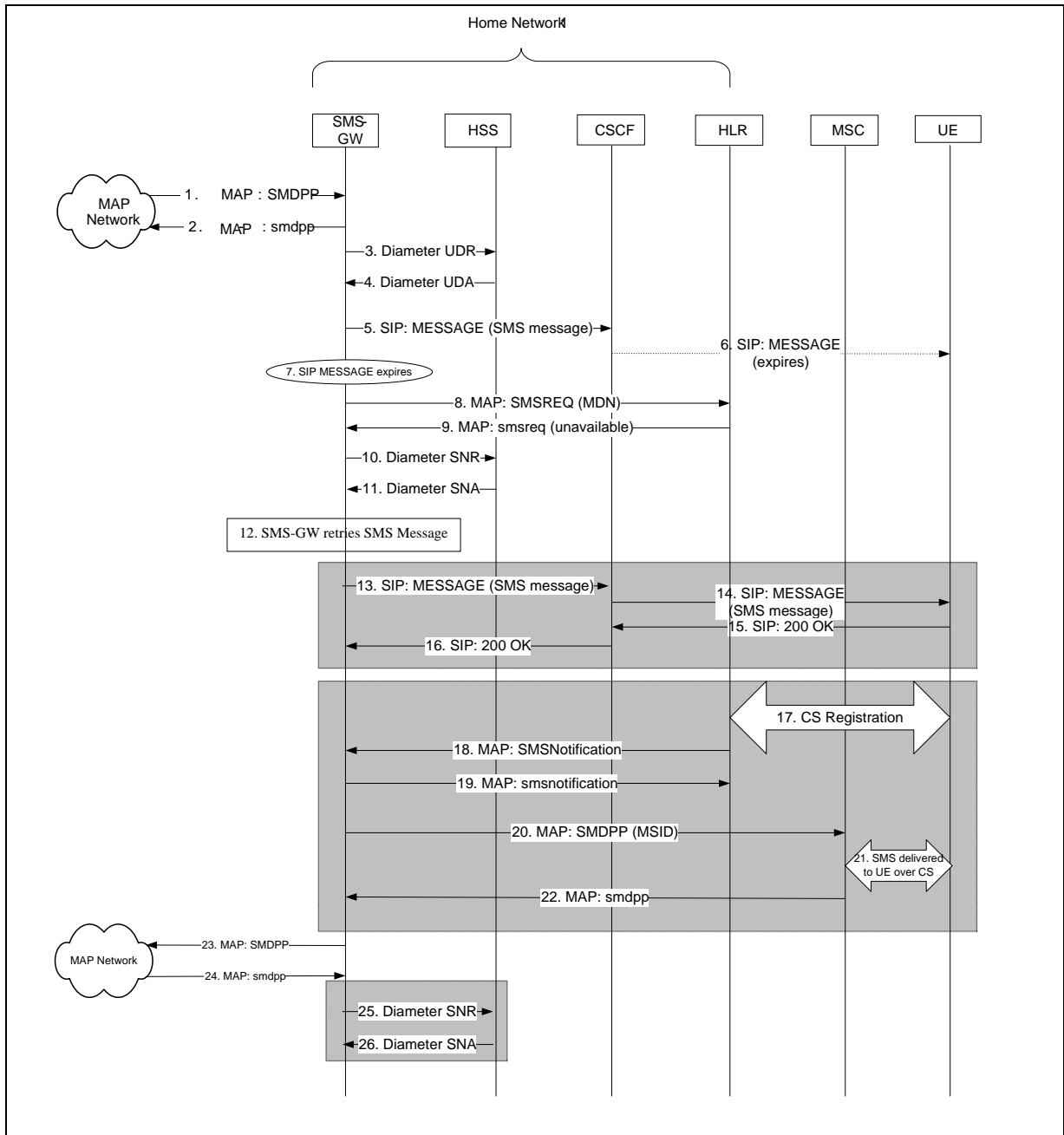*Figure 6.11* **Initial IMS Delivery Attempt, IMS Registered, Not 1x CS Registered, No 3rd party registration, SMS-GW retries**

Preconditions:

- UE is IMS registered,

- UE is not 1x CS registered

- SMS-GW does not receive 3rd party registration.

1. The SMS-GW for UE receives a MAP SMDPP message for UE from an originating SMS-GW. The originating SMS-GW is not shown for brevity.

2. The SMS-GW responds by sending a MAP smdpp message back to the originating SMS-GW.

3. The SMS-GW sends a Diameter UDR message to the HSS to determine whether or not UE is IMS registered. The SMS-GW queries the HSS using the MDN of the UE received in step 1.

4. The HSS responds by sending a Diameter UDA message to the SMS-GW indicating that UE is IMS registered. The HSS also returns UE's S-CSCF address.

5. The SMS-GW sends a SIP MESSAGE to UE's S-CSCF containing the SMS message received in step 1. An Expires header field is included in the SIP MESSAGE, after which the message expires.

6. Based on the SIP method and content type, the S-CSCF forwards the SIP MESSAGE to UE via UE's P-CSCF. UE's P-CSCF is not shown for brevity.

7. The SIP MESSAGE expires (as indicated by the Expires header) from step 5 or failed to deliver.

8. When the SIP MESSAGE expires or fails to deliver, the SMS-GW sends an MAP SMSREQ to the HLR containing the UE's MDN in order to determine UE's current routing information and retrieve UE's MSID information. The SMS_NotificationIndicator in the MAP SMSREQ is set to "Notify when available".

9. The HLR sends an MAP smsreq back to the SMS-GW indicating the UE is currently unavailable in the 1x CS Network.

10. The SMS-GW sends a Diameter Subscribe-Notification-Request (SNR) to the HSS, indicating that it should be notified when UE de-registers and is assigned an S-CSCF.

11. The HSS sends a Diameter Subscribe-Notification-Answer (SNA) response to the SMS-GW.

12. SMS-GW retries to deliver the SMS message periodically, while waiting for a de-registration notification from the HSS or SMSNotification message from HLR.

13-16. The SMS-GW successfully delivers the SMS message to the UE via IMS network. Steps 20-22 are skipped.

17-19. The UE registers on the 1x CS network with the MSC and HLR. Upon receiving SMSNotification message from HLR, SMS-GW responds with smsnotification message.

20-22. If SMS message has not been sent, SMS-GW stops retrying and sends SMS message via 1x CS network.

23. If required in the original MAP SMDPP message, the SMS-GW generates a MAP SMDPP message to the originating SMS-GW to inform it about the delivery status.

24. The originating SMS-GW responds by sending a MAP smdpp message back to SMS-GW.

25-26. The SMS-GW may optionally use SNR/SNA to unsubscribe for registration related events from the HSS.

6.2.10   Initial IMS Delivery Attempt, IMS Registered, Not 1x CS Registered, 3rd party registration, SMS-GW retries
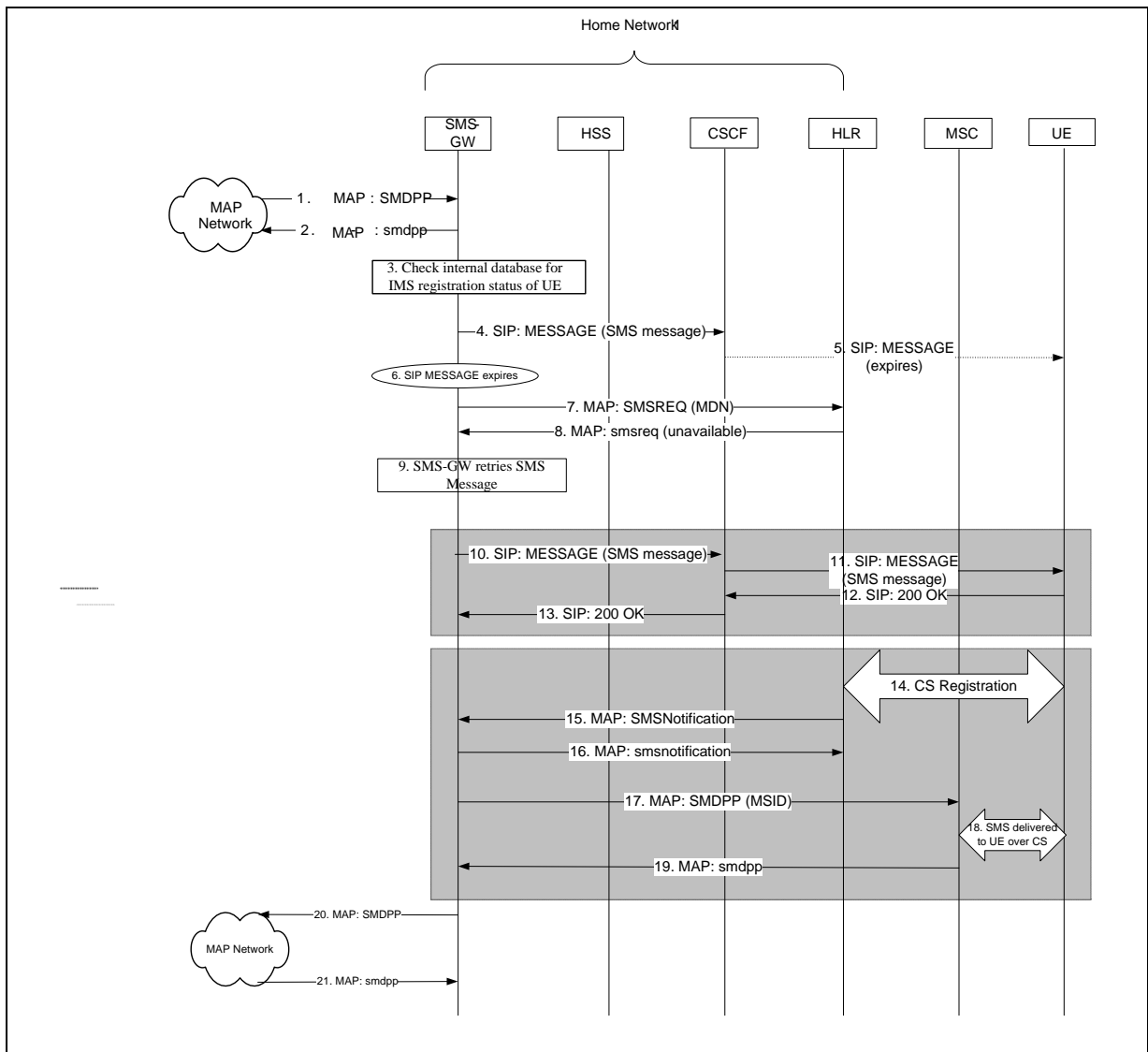
Figure 6.12   **Initial IMS Delivery Attempt, IMS Registered, Not 1x CS Registered, 3rd party registration, SMS-GW retries**

Preconditions:

- UE is IMS registered.

- UE is not 1x CS registered.

- SMS-GW receives 3rd party registration.

1. The SMS-GW for UE receives a MAP SMDPP message for UE from an originating SMS-GW. The originating SMS-GW is not shown for brevity.

2. The SMS-GW responds by sending a MAP smdpp message back to the originating SMS-GW.

3.   The SMS-GW checks its internal database and determines that the UE is IMS registered.

4.   The SMS-GW sends a SIP MESSAGE to UE's S-CSCF containing the SMS message received in step 1. An Expires header field is included in the SIP MESSAGE, after which the message expires.

5.   Based on the SIP method and content type, the S-CSCF forwards the SIP MESSAGE to UE via UE's P-CSCF. UE's P-CSCF is not shown for brevity.

6.   The SIP MESSAGE expires (as indicated by the Expires header) from step 4 or failed to deliver.

7.   When the SIP MESSAGE expires or fails to deliver, the SMS-GW sends an MAP SMSREQ to the HLR containing the UE's MDN in order to determine UE's current routing information and retrieve UE's MSID information. The SMS_NotificationIndicator in the MAP SMSREQ is set to "Notify when available".

8.   The HLR sends an MAP smsreq back to the SMS-GW indicating the UE is currently unavailable in the 1x CS Network.

9.   SMS-GW retries to deliver the SMS message periodically, while waiting for a de-registration notification from the S-CSCF or SMSNotification message from the HLR.

10-13.   The SMS-GW successfully delivers the SMS message to the UE via IMS network. Steps 17-19 are skipped.

14-16.   The UE registers on the 1x CS network with the MSC and HLR. Upon receiving SMSNotification message from HLR, SMS-GW responds with smsnotification message.

17-19.   If SMS message has not been sent, SMS-GW stops retrying and sends SMS message via 1x CS network.

20.   If required in the original MAP SMDPP message, the SMS-GW generates a MAP SMDPP message to the originating SMS-GW to inform it about the delivery status.

21.   The originating SMS-GW responds by sending a MAP smdpp message back to SMS-GW.

6.3   SMS Origination Procedures

6.3.1   SMS Origination by UE that is IMS Registered

Figure 6.13 illustrates a signaling flow for the scenario where a terminal that is SIP registered and tuned to HRPD originates an SMS message. In this flow, it is assumed that the originating SMS-GW and the terminating SMS-GW communicate over the MAP network.
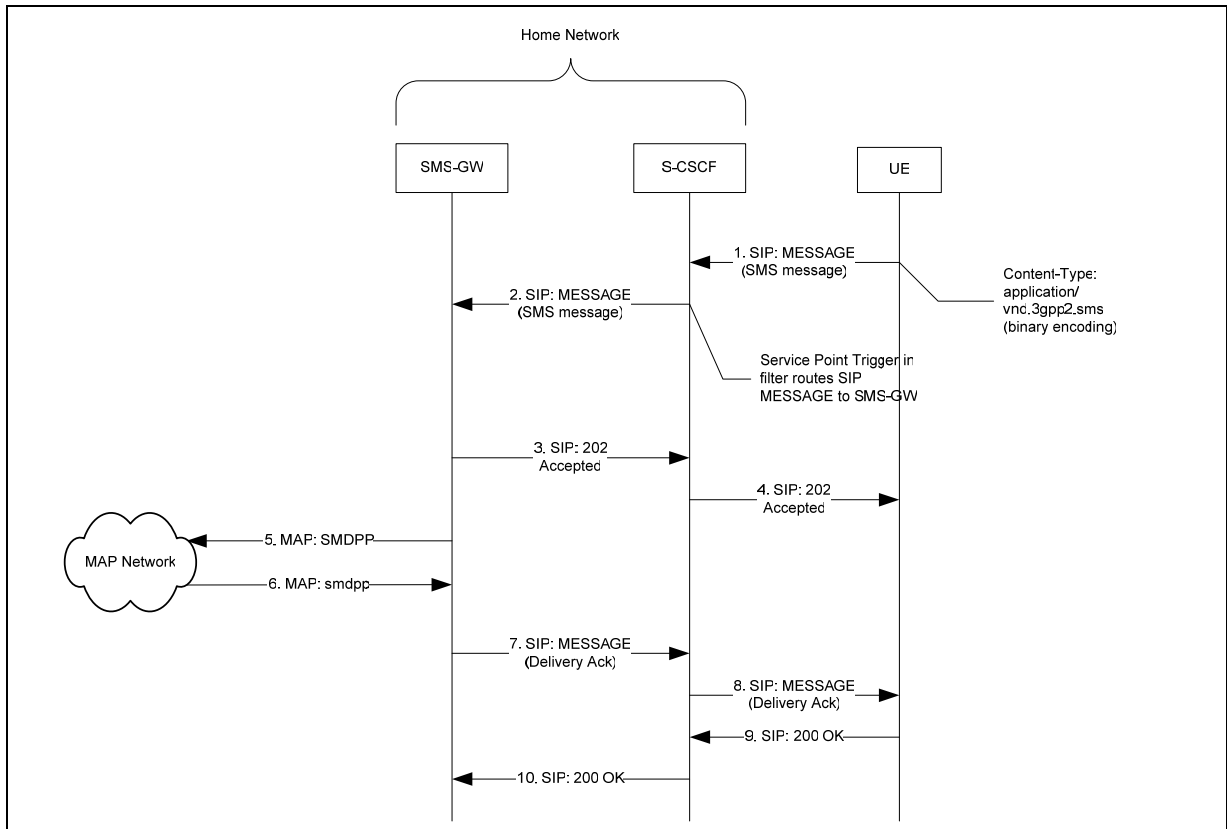
Figure 6.13 **SMS origination, terminal IMS registered and tuned to HRPD**

1. The originating UE formats an SMS text message using its SMS client software and sends the SMS text message in a SIP MESSAGE to another SMS user via the originating UE's P-CSCF and S-CSCF. The originating UE's P-CSCF is not shown for brevity. The originating UE inserts its tel URI in the From header and P-Preferred-ID header, and the tel URI of the SMS message receiver in the To header and Request URI. The Content-Type value associated with the SIP MESSAGE shall be "application/vnd.3gpp2.sms". The payload of the SIP MESSAGE shall contain a binary encoded SMS transport layer SMS Point-to-Point message [C.S0015].

2. The S-CSCF, based on the P-Asserted-Identity header and the filter Service Point Trigger, forwards the SIP MESSAGE to the SMS-GW for the originating UE.

3. The SMS-GW responds by sending a SIP 202 Accepted to the S-CSCF.

4. The S-CSCF forwards the SIP 202 Accepted to the originating UE via the UE's P-CSCF. The originating UE's P-CSCF is not shown for brevity.

5. The originating UE's SMS-GW delivers the SMS message to the terminating SMS-GW in a MAP SMDPP message. The terminating SMS-GW is not shown for brevity.

6. The terminating SMS-GW responds by sending a MAP smdpp message back to the sender of the MAP SMDPP message.

7. If required in the original SIP MESSAGE, the SMS-GW generates a delivery acknowledgement in a SIP MESSAGE to the originating UE via the UE's S-CSCF and P-CSCF to inform it about the delivery status. The Content-Type value

associated with the SIP MESSAGE is set to "application/vnd.3gpp2.sms". The payload of the SIP MESSAGE contains a binary encoded SMS transport layer SMS Point-to-Point message [C.S0015]. The To header and Request URI of the SIP MESSAGE are set to tel-URI of the originating UE. The SMS-GW will also insert its SIP URI (i.e. the PSI) in the From header and P-Asserted-Identity header of the SIP MESSAGE.

8. The S-CSCF forwards the SIP MESSAGE to the originating UE via the UE's P-CSCF. The originating UE's P-CSCF is not shown for brevity.

9. The originating UE responds by sending a SIP 200 OK back to the SMS-GW via the originating UE's P-CSCF and S-CSCF. The originating UE's P-CSCF is not shown for brevity.

10. The originating UE's S-CSCF forwards the SIP 200 OK to the SMS-GW.

6.4   SMS-GW to SMS-GW Communication over IMS Core Network

6.4.1   Inter SMS-GWs communication with subscriber address resolution

The MC functions are integrated into the SMS-GWs. Since the home networks of the SMS message sender and the SMS message receiver are IMS networks, the SMS-GWs exchange the SMS messages over the core IP network. In this flow, the originating SMS-GW, upon accessing ENUM or a private database, obtains the SIP URI of the SMS message receiver (the UE), rather then the SIP URI of the terminating SMS-GW. In this flow, the originating network policies require that the originating SMS-GW routes the outgoing SIP MESSAGEs via the S-CSCF instead sending them directly to the I-CSCF in the destination IMS network.

Figure 6.14   **Inter SMS-GWs communication with subscriber address resolution**

1. The SMS message sender sends a SIP MESSAGE with the SMS message in the body, and inserts its tel URI in the From header and P-Preferred-ID header, and the tel URI of the SMS message receiver in the To header and Request URI. The S-CSCF forwards the SIP MESSAGE, based on the originating iFC and the SMS body, to the originating SMS-GW.

2. The originating SMS-GW, using ENUM or a private database, translates the tel URI of the SMS message received into a SIP URI of the SMS message receiver (the UE), rather then the SIP URI of the terminating SMS-GW.

3. The originating SMS-GW constructs new SIP MESSAGE that contains the translated SIP URI in the Request URI, the tel URI of the SMS message sender in the From header, the SIP URI of the originating SMS-GW in the P-Asserted-Identity header, the tel URI of the SMS message receiver in the To header, and forward the SIP MESSAGE to the S-CSCF. In addition, the originating SMS-GW sets the Route header to the SIP URI of the S-CSCF and includes the "orig" in the Route header, and forward the SIP MESSAGE to the S-CSCF.

NOTE: The SIP URI of the originating SMS-GW that the originating SMS-GW inserted in the P-Asserted-Identity header is resolved by the global DNS to an I-CSCF address in the domain where the originating SMS-GW is located (see [MMD Part-2] section 5.4.12.4).

4. The S-CSCF routes the SIP MESSAGE based on the Request URI to the I-CSCF of the terminating IMS domain. The I-CSCF (not shown) of the terminating IMS

domain forwards the SIP MESSAGE to the terminating S-CSCF that serves the SMS message receiver.

5.   The terminating S-CSCF, upon receiving the SIP MESSAGE from the I-CSCF, invokes the terminating iFC for the SMS message receiver and forwards the SIP MESSAGE to the terminating SMS-GW that serves the SMS message receiver.

6.   If delivery report was requested, the terminating SMS-GW saves the SIP URI of the originating SMS-GW that was included in the P-Asserted-Identity header of the received SIP MESSAGE. The terminating SMS-GW returns a SIP 202 Accepted to the terminating S-CSCF.

7.   The terminating S-CSCF returns the SIP 202 Accepted to the originating S-CSCF.

8.   The originating S-CSCF returns the SIP 202 Accepted to the originating SMS-GW.

9.   The terminating SMS-GW delivers the SMS message to the SMS message receiver.

10. If required in the original SMS message, the terminating SMS-GW generates an SMS delivery acknowledgement and sends it to the originating SMS-GW. The terminating SMS-GW puts the SMS delivery acknowledgement into the SIP MESSAGE body and inserts the saved SIP URI of the originating SMS-GW into the Request URI, the tel URI of the SMS message receiver into the From header, and the tel URI of the original SMS message sender into the To header. In addition, the terminating SMS-GW set the Route header with "orig" to the SIP URI of the terminating S-CSCF, and forward the SIP MESSAGE to the terminating S-CSCF.

11. Since the request arrived from the terminating SMS-GW and includes the "orig" parameter in the Route header, the terminating S-CSCF does not employ the iFC and routes the SIP MESSAGE based on the Request URI to the I-CSCF of the originating IMS domain. The terminating S-CSCF resolves the SIP URI of the originating SMS-GW (by the global DNS) to the I-CSCF address in the domain where the originating SMS-GW is located.

12. Since the I-CSCF in the originating IMS domain hosts the SIP URI of the originating SMS-GW, the I-CSCF forwards the SIP MESSAGE directly to the originating SMS-GW.

13. The originating SMS-GW returns a SIP 202 Accepted to the I-CSCF.

14. The I-CSCF returns the SIP 202 Accepted to the S-CSCF.

15. The S-CSCF returns the SIP 202 Accepted to the terminating SMS-GW.

16. The originating SMS-GW forwards the SMS delivery acknowledgement to the SMS message sender.

6.4.2   Inter SMS-GWs communication with address resolution to SMS-GW

This flow assumes that the public ENUM does not contain the resource record for the user's E.164 number. Hence, the originating SMS-GW upon accessing either the infrastructure ENUM or a private database obtains the SIP URI (i.e. the PSI) of the terminating SMS-GW (see [MMD Part-2]). In addition, the network policies in the originating IMS networks allow the originating SMS-GW to route the outgoing SIP MESSAGEs directly to the I-CSCF in the terminating IMS network.
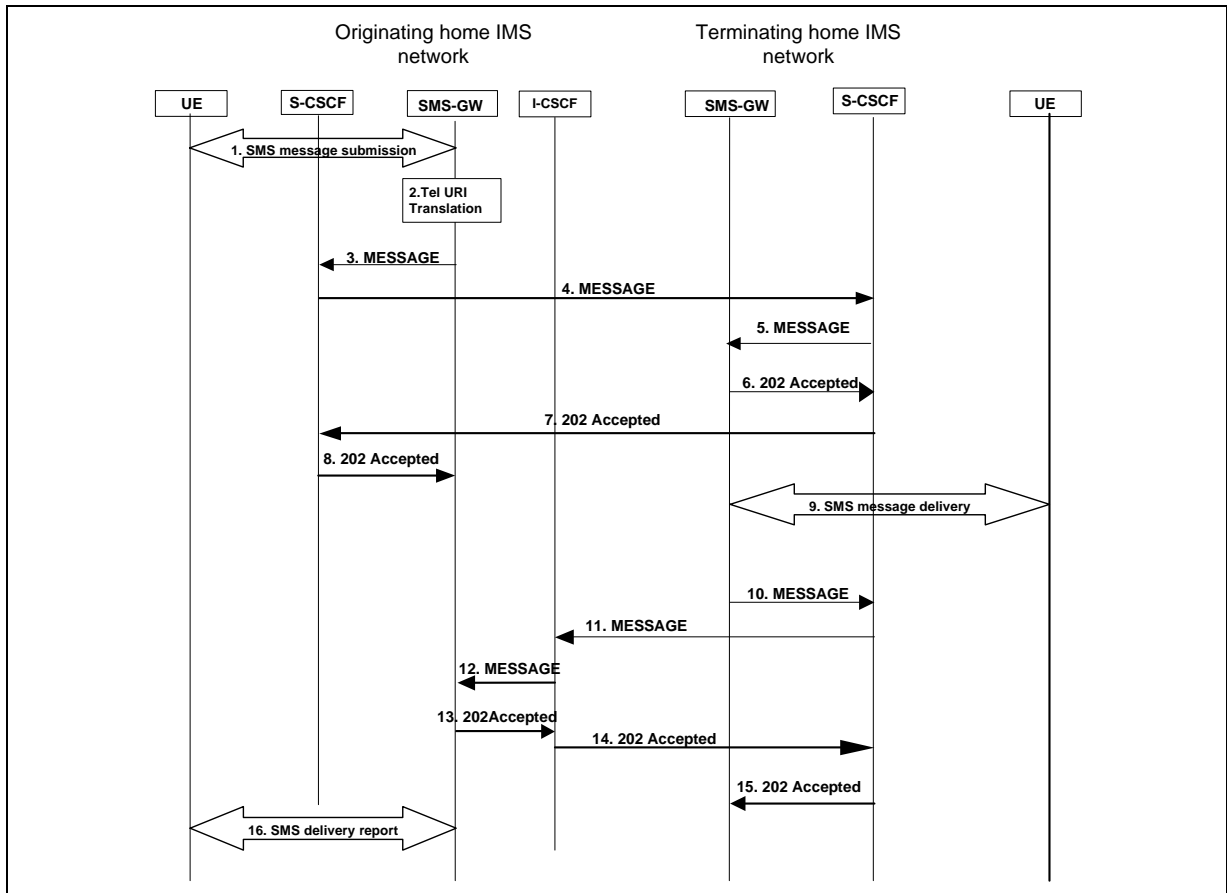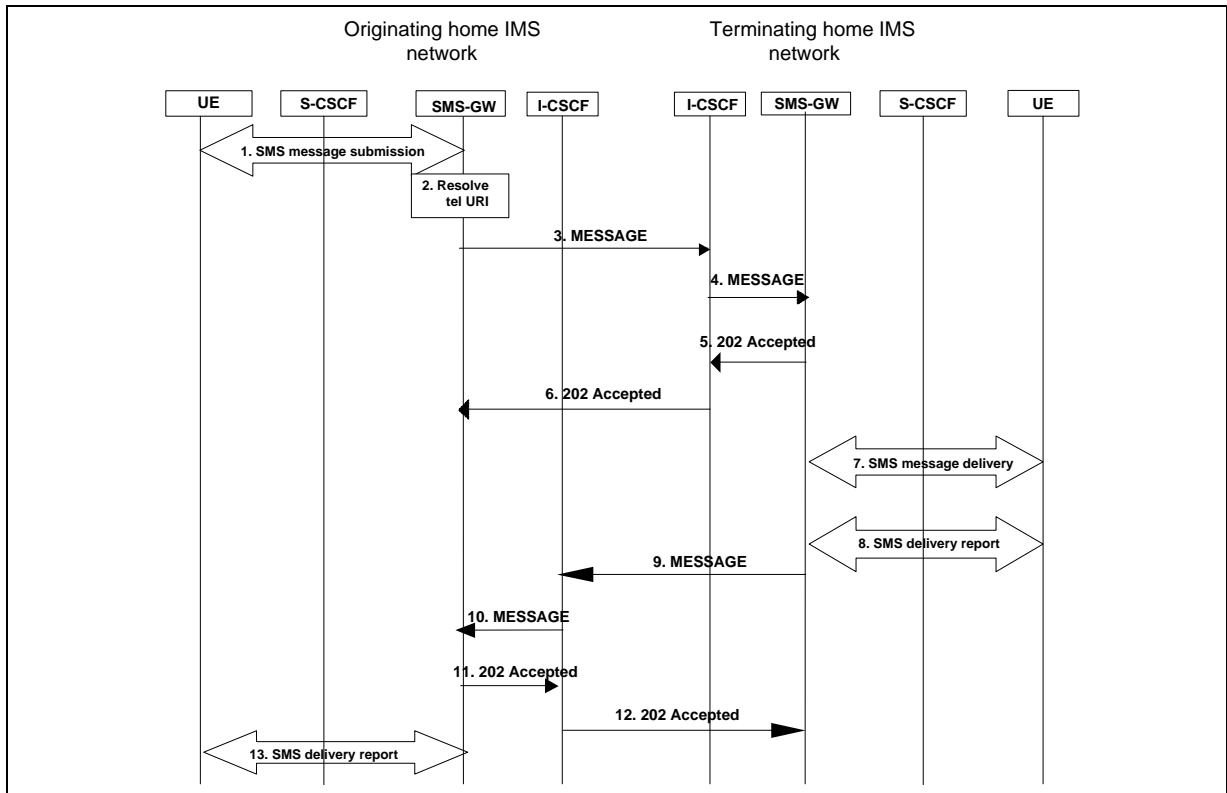
Figure 6.15 **Inter SMS-GWs communication with address resolution to SMS-GW**

1. The SMS message sender sends a SIP MESSAGE with the SMS message in the body, and inserts its tel URI in the From header and P-Preferred-ID header, and the tel URI of the SMS message receiver in the To header and Request URI. The S-CSCF forwards the SIP MESSAGE based on the originating iFC and the SMS body to the originating SMS-GW.

2. The originating SMS-GW accessing the infrastructure ENUM or a private database and obtains the SIP URI of the terminating SMS-GW. Subsequently the originating SMS-GW resolves the SIP URI of the terminating SMS-GW (by the global DNS) to the I-CSCF address in the domain where the terminating SMS-GW is located (see [MMD Part-2] section 5.4.12.4).

3. The originating SMS-GW constructs new SIP MESSAGE that contains the SIP URI of the terminating SMS-GW in the Request URI, the tel URI of the SMS message sender in the From header, the SIP URI of the originating SMS-GW in the P-Asserted-Identity header, the tel URI of the SMS message receiver in the To header, and forward the SIP MESSAGE to the I-CSCF address obtained in step 2.

NOTE: The SIP URI of the originating SMS-GW that the originating SMS-GW inserted in the P-Asserted-Identity header is resolved by the global DNS to an I-CSCF address in the domain where the originating SMS-GW is located (see [MMD Part-2] section 5.4.12.4).

4. The I-CSCF receives the SIP MESSAGE that indicates in the Request URI that is destined to the terminating SMS-GW. Since the I-CSCF in the terminating IMS domain hosts the SIP URI of the terminating SMS-GW, the I-CSCF forwards the SIP MESSAGE directly to the terminating SMS-GW.

5. The terminating SMS-GW returns a SIP 202 Accepted to the terminating I-CSCF. If delivery report was requested, the terminating SMS-GW saves the SIP URI of the originating SMS-GW that was included in the P-Asserted-Identity header of the received SIP MESSAGE.

6. The terminating I-CSCF returns the SIP 202 Accepted to the originating SMS-GW.

7. The terminating SMS-GW delivers the SMS message to the SMS message receiver.

8. If required in the original SMS delivery message, the SMS message receiver generates an SMS delivery acknowledgement and sends it to the terminating SMS-GW.

9. The terminating SMS-GW puts the SMS delivery acknowledgement into the SIP MESSAGE body and inserts the saved SIP URI of the originating SMS-GW into the Request URI, the tel URI of the SMS message receiver into the From header, and the tel URI of the of the original SMS message sender into the To header. Subsequently the terminating SMS-GW resolves the SIP URI of the originating SMS-GW (by the global DNS) to the I-CSCF address in the domain where the originating SMS-GW is located.

10. Since the I-CSCF in the originating IMS domain hosts the SIP URI of the originating SMS-GW, the I-CSCF forwards the SIP MESSAGE directly to the originating SMS-GW.

11. The originating SMS-GW returns a SIP 202 Accepted to the I-CSCF.

12. The I-CSCF returns the SIP 202 Accepted to the terminating SMS-GW.

13. The originating SMS-GW forwards the SMS delivery acknowledgement to the SMS message sender.

7 SIP Related Procedures

7.1 Introduction

Void.

7.2 Functional entities

7.2.1 User Equipment (UE)

A UE may implement the roles of SMS-over-IMS sender (see section 7.3.1) and SMS-over-IMS receiver (see section 7.3.2) for sending and receiving SMS over IMS.

The UE shall follow the procedures defined in [C.S0015] for sending and receiving SMS over 1x CS.

7.2.2 Application Server (AS)

An AS may implement the role of an SMS-GW (see section 7.3.3).

7.2.3   Home Subscriber Server (HSS)

During the UE registration, if the subscriber has subscribed to SMS-over-IMS service, the HSS shall include in the iFCs downloaded to the S-CSCF, the SPTs [MMD Part-5] for routing relevant SIP messages to the SMS-GW. The SIP messages that are routed to the SMS-GW include registration messages, originating SMS-over-IMS messages, and terminating SMS-over-IMS messages. In addition to the SPTs, the HSS shall include the MDN of the UE within the Service Information element (see [MMD Part-5]) of the initial filter criteria. The MDN will be transparently passed by the S-CSCF to the SMS-GW during third-party registration.

7.2.4   Home Location Register (HLR)

There are no SMS over IMS specific procedures at the HLR.

7.2.5   S-CSCF

When the S-CSCF sends a third-party SIP REGISTER to the SMS-GW, the S-CSCF shall follow the procedures as specified in [MMD Part-4]. In addition, if the "Timestamp header is sent by the UE in a SIP REGISTER, the S-CSCF shall transparently pass that along in the third-party SIP REGISTER to the SMS-GW (as it would to all other AS in user's profile for the SIP REGISTER).

7.3   Roles

7.3.1   SMS-over-IMS sender

7.3.1.1   General Procedures

In addition to the procedures specified in section 7.3.1, the SMS-over-IMS sender shall support the appropriate UE related procedures specified in [MMD Part-4]. The SMS-over-IMS sender shall support the procedures defined in [C.S0015] for constructing an SMS message.

The SMS-over-IMS sender shall not submit simultaneous SMS-over-IMS messages over IMS to the originating SMS-GW. The SMS-over-IMS sender shall wait for an acknowledgement from the originating SMS-GW indicating that the previously submitted SMS-over-IMS has been received, prior to submitting another SMS-over-IMS message to the originating SMS-GW.

7.3.1.2   Registration

When the SMS-over-IMS sender registers with the IMS subsystem, the SMS-over-IMS sender shall apply the procedures as specified in [MMD Part-4]. When constructing a SIP REGISTER, the SMS-over-IMS sender shall include a Timestamp header [RFC 3261] in the SIP REGISTER. The value of the Timestamp header shall be set to the time, in seconds since January 1, 1900 00:00 UTC, at which the SMS-over-IMS sender generated the SIP REGISTER.

If the SMS-over-IMS sender is both IMS registered and 1x CS registered and the SMS-over-IMS sender detects that the IMS network coverage is temporarily unavailable but the SMS-over-IMS sender still has 1x CS network coverage, based on operator policy, the SMS-over-IMS sender shall send an SMS on the 1x CS network, to notify the SMS-GW that

it is reachable only through the 1x CS domain. The SMS message is constructed as specified in section 5.3.2.1 of [VCC] with the following exception:

- The SMS-over-IMS sender shall set the Parameter ID '00000100' (Destination Address) of the SMS Point-to-Point message to the address of the SMS-GW.

The SMS-over-IMS sender shall follow the procedures specified in section 5.3.2.2 of [VCC] for processing SMS acknowledgements.

When the SMS-over-IMS sender regains IMS coverage, if the SMS-over-IMS sender had previously sent an SMS with a 1x CS-only status indication, the SMS-over-IMS sender shall send a SIP re-REGISTER over IMS to indicate to the SMS-GW that it has regained IMS coverage.

7.3.1.3   Submitting a short message

When an SMS-over-IMS sender wants to submit an SMS message over IMS, the SMS-over-IMS sender shall send a SIP MESSAGE with the following information:

1. The Request-URI shall be set to SIP URI or tel URI of the destination UE, or, if available, the SIP URI of the SMS-GW.

2. the Request-Disposition header shall contain the "no-fork" directive

3. the Content-Type header shall be set to "application/vnd.3gpp2.sms"

4. The body of the request shall contain an SMS "Submit" message, including the SMS Transport layer and SMS Teleservice layer information, as defined in [C.S0015] and encoded in binary. The SMS-over-IMS sender shall set the value of the Content-Transfer-Encoding header to "binary".

5. the From header shall contain the tel URI or SIP URI of the SMS-over-IMS sender.

6. the To header shall be set to the URI specified in the Request-URI.

If the SMS-over-IMS sender included the SMS Transport Layer parameter "Bearer Reply Option" in the encapsulated SMS Point-to-Point message, the SMS-over-IMS sender shall process the SMS Transport layer "SMS Acknowledge" message as specified in section 7.3.1.4.

7.3.1.4   Processing an SMS Transport layer "SMS Acknowledge" message

Upon receiving a SIP MESSAGE with the Content-type header set to "application/vnd.3gpp2.sms", which contains an encapsulated "SMS Acknowledge" message, the SMS-over-IMS sender shall:

a.   generate a SIP response according to [RFC 3428]; and

b.   extract the SMS message from the SIP MESSAGE body and process the "SMS Acknowledge" message as defined in [C.S0015].

7.3.1.5   Processing of SMS "User Acknowledgement Message" or SMS "Delivery Acknowledgement Message"

Upon receiving a SIP MESSAGE with a body of MIME type "application/vnd.3gpp2.sms" containing an SMS "User Acknowledgement" message or SMS "Delivery Acknowledgement" message, the SMS-over-IMS sender shall:

a.   generate a SIP response according to [RFC 3428];

b.   process the SMS Point-to-Point message received in the SIP MESSAGE as defined in [C.S0015].

c.   if the SMS-GW had included the SMS Transport Layer parameter "Bearer Reply Option" in the SMS message, the SMS-over-IMS sender shall generate the SMS Transport layer "SMS Acknowledge" message as specified in section 7.3.2.4 with the exception that SMS-over-IMS sender, instead of the SMS-over-IMS receiver, generates the "SMS Acknowledge" message.

Note: According to [C.S0015], if the incoming SMS message is an SMS "Delivery Acknowledgement" message or an SMS "User Acknowledgement" message, the actions to be taken are implementation dependent.

7.3.2   SMS-over-IMS receiver

7.3.2.1   General Procedures

In addition to the procedures specified in section 7.3.2, the SMS-over-IMS receiver shall support the appropriate UE related procedures specified in [MMD Part-4]. The SMS-over-IMS receiver shall support the procedures defined in [C.S0015] for receiving an SMS message.

7.3.2.2   Registration

When the SMS-over-IMS receiver registers with the IMS subsystem, the SMS-over-IMS receiver shall apply the procedures as specified in [MMD Part-4]. When constructing a SIP REGISTER, the SMS-over-IMS receiver shall include a Timestamp header [RFC 3261] in the SIP REGISTER. The value of the Timestamp header shall be set to the time, in seconds since January 1, 1900 00:00 UTC, at which the SMS-over-IMS receiver generated the SIP REGISTER.

If the SMS-over-IMS receiver is both IMS registered and 1x CS registered and the SMS-over-IMS receiver detects that the IMS network coverage is temporarily unavailable but the SMS-over-IMS receiver still has 1x CS network coverage, based on operator policy, the SMS-over-IMS receiver shall send an SMS on the 1x CS network, to notify the SMS-GW that it is reachable only through the 1x CS domain. . The SMS message is constructed as specified in section 5.3.2.1 of [VCC] with the following exception:

▪   the SMS-over-IMS receiver shall set the Parameter ID '00000100' (Destination Address) of the SMS Point-to-Point message to the address of the SMS-GW.

The SMS-over-IMS receiver shall follow the procedures specified in section 5.3.2.2 of [VCC] for processing SMS acknowledgements.

When the SMS-over-IMS receiver regains IMS coverage, if the SMS-over-IMS receiver had previously sent an SMS with a 1x CS-only status information, the SMS-over-IMS receiver

shall send a SIP re-REGISTER over IMS to indicate to the SMS-GW that it has regained IMS coverage.

7.3.2.3   Receiving a short message

Upon receiving a SIP MESSAGE with the Content-type header set to "application/vnd.3gpp2.sms", which contains an SMS "Deliver" message, the SMS-over-IMS receiver shall:

a.   generate a SIP response according to [RFC 3428].

b.   process the SMS Point-to-Point message received in the SIP MESSAGE as defined in [C.S0015].

c.   if the SMS Transport Layer parameter "Bearer Reply Option" is included in the SMS message, the SMS-over-IMS receiver shall save the SIP URI of the SMS-GW and generate the SMS Transport layer "SMS Acknowledge" message as specified in section 7.3.2.4.

7.3.2.4   "SMS Acknowledge Message" generation

When an SMS-over-IMS receiver wants to generate an SMS Transport layer "SMS Acknowledge" message over IMS, the SMS-over-IMS receiver shall send a SIP MESSAGE with the following information:

a.   the Request-URI shall be set to the SIP URI of SMS-GW;

NOTE: The address of the SMS-GW is obtained from the P-Asserted-Identity header of SMS-over-IMS message received in section 7.3.2.3.

b.   the Request-Disposition header shall contain the "no-fork" directive;

c.   the Content-Type header shall contain "application/vnd.3gpp2.sms"; and

d.   the body of the request shall contain the SMS Transport layer "SMS Acknowledge" message, constructed according to procedures defined in [C.S0015] and encoded in binary format. The SMS-over-IMS receiver shall set the value of the Content-Transfer-Encoding header to "binary".

7.3.3   SMS-GW

7.3.3.1   General

An SMS-GW is an entity that stores and forwards SMS messages to and from an SME that is either IMS registered and/or 1x CS registered.

In addition to the procedures specified in section 7.3.3, the SMS-GW shall support the AS procedures specified in [MMD Part-4]. The SMS-GW shall support the procedures defined in [C.S0015] for construction of an SMS message.

The SMS-GW shall not deliver simultaneous SMS-over-IMS messages to the SMS-over-IMS receiver. The SMS-GW shall wait for an acknowledgement from the SMS-over-IMS receiver

indicating that the previously delivered SMS-over-IMS message has been received, prior to delivering another SMS-over-IMS message to the SMS-over-IMS receiver.

7.3.3.2   Processing of third-party registration/de-registration

Upon receiving a 3rd party SIP REGISTER from the S-CSCF and if the SMS-GW supports the 3rd party registration/de-registration, the SMS-GW shall do the following:

- the SMS-GW shall send an appropriate SIP response (e.g., 200 OK) to the SIP REGISTER.

- the SMS-GW shall store the MDN sent in the message body of the SIP REGISTER within the <service-info> XML element and the address of the S-CSCF serving the UE extracted from the Contact header of the SIP REGISTER.

- If the SMS-GW supports the IMSST feature and if a Timestamp header is present in the third-party SIP REGISTER, the SMS-GW shall store the value of the header.

- If the Expires header contains a non-zero value, the SMS-GW shall mark the UE as registered over IMS. If the Expires header contains a zero value, the SMS-GW shall mark the UE as unregistered over IMS. The SMS-GW may optionally subscribe to the "reg" event package of the UE using the public user identity received in the SIP REGISTER.

Upon receiving an SMS from the SMS-over-IMS sender or SMS-over-IMS receiver with the Teleservice identifier set to IMSST and the SMS-GW supports the IMSST feature, the SMS-GW shall do the following:

- If the VCC Message Type is 'Domain-Attachment-Status' and the 'Domain-Status' field is set to 0x00 (1x CS-only), the SMS-GW shall check to see whether the "Timestamp" field is later than the previously stored timestamp value. If the time in the SMS message is later, the SMS-GW shall store the new timestamp value, and shall mark the UE's status as reachable only over 1x CS domain. Otherwise, the SMS-GW shall ignore the SMS message.

7.3.3.3   Processing of SMS message submissions from SMS-over-IMS sender

Upon receiving a SIP MESSAGE from an SMS-over-IMS sender with a body of MIME type "application/vnd.3gpp2.sms" containing an SMS "Submit" message, the originating SMS-GW shall:

a. generate a SIP response according to [RFC 3428].

b. process the SMS-Point-to-Point message received in SIP MESSAGE as defined in [C.S0015].

c. if the SMS-over-IMS sender had included the SMS Transport Layer parameter "Bearer Reply Option" in the SMS message, the SMS-GW shall generate the SMS Transport layer "SMS Acknowledge" message as specified in section 7.3.3.3.1.

d. determine whether the SMS message needs to be forwarded to the destination SMS-GW over IMS or MAP.

Note: It is outside the scope of this specification as to how the SMS-GW determines whether SMS message needs to be forwarded over MAP or IMS.

- If the SMS message needs to be forwarded to the destination SMS-GW over IMS, the SMS-GW shall follow the procedures defined in section 7.3.3.5

- If the SMS message needs to be forwarded to the destination SMS-GW over MAP, the SMS-GW shall follow the procedures defined in [MAP].

7.3.3.3.1   SMS Acknowledge Message generation

To generate an SMS Transport layer "SMS Acknowledge" message over IMS, the originating SMS-GW shall send a SIP MESSAGE with the following information:

a. the Request-URI shall be set to the SMS-over-IMS sender's SIP URI or tel URI.

NOTE: The URI of the SMS-over-IMS sender is obtained from the P-Asserted-Identity of the SIP MESSAGE received in section 7.3.3.3.

b. the Request-Disposition header shall contain the "no-fork" directive.

c. the Content-Type header shall contain "application/vnd.3gpp2.sms"; and

d. the body of the request shall contain the SMS Transport layer "SMS Acknowledge" message, constructed according to procedures defined in [C.S0015] and encoded in binary format. The SMS-GW shall set the value of the Content-Transfer-Encoding header to "binary".

7.3.3.3.2   Forwarding of SMS "User Acknowledgement message" and "Delivery Acknowledgement" message at the originating SMS-GW

Upon receiving an "SMDPP INVOKE" message from a terminating SMS-GW over MAP or IMS containing an SMS "Delivery Acknowledgement" message or SMS "User Acknowledgement" message, the originating SMS-GW shall do the following:

a. if the "SMDPP INVOKE" message was received over IMS:

    1. send a SIP "202 Accepted" response to the terminating SMS-GW according to [RFC 3428];

    2. generate an "SMDPP RETURN RESULT" message towards the terminating SMS-GW over IMS as described in section 7.3.3.5.4.1, with the exception that originating SMS-GW, instead of the terminating SMS-GW, generates the "SMDPP RETURN RESULT".

b. If the "SMDPP INVOKE" message was received over MAP, generate an "SMDPP RETURN RESULT" over MAP as specified in [MAP].

c. if the preferred domain is IMS and the UE is registered over IMS, the SMS-GW shall construct a SIP MESSAGE request with the following information:

    1. the Request-URI shall be set to the tel URI or SIP URI of the SMS-over-IMS sender.

    2. the To header shall be set to the same URI used in the Request-URI.

    3. the From header shall contain the SIP URI of the SMS-GW.

4. the P-Asserted-Identity header shall contain the SIP URI of the SMS-GW.

5. the Request-Disposition header shall contain the "no-fork" directive.

6. P-Charging-Vector header shall contain the parameters populated as specified in [MMD Part-4].

7. the Content-Type header shall contain "application/vnd.3gpp2.sms"; and

8. the body of the request shall contain the SMS "Delivery Acknowledgement" message or the SMS "User Acknowledgement" message, as appropriate, constructed as specified in [C.S0015] and encoded in binary format, based on the message received from the terminating SMS GW. The SMS-GW shall set the value of the Content-Transfer-Encoding header to "binary".

Then, the SMS-GW shall send the SIP MESSAGE request to the SMS-over-IMS sender as specified in [MMD Part-4];

d. if the preferred domain is 1x CS and the UE is registered in the 1x CS, the SMS-GW shall following the procedures defined in [C.S0015] for delivering SMS messages to the UE over 1x CS.

e. if the UE is not registered in the preferred domain, based on operator policy, the SMS-GW may try to deliver the SMS message over other non-preferred domains, using the appropriate mechanisms and procedures specific to that domain.

7.3.3.4   Processing of SMS messages deliveries to SMS-over-IMS receiver at terminating SMS-GW

Upon receiving an "SMDPP INVOKE" message containing an SMS "Submit" message from an originating SMS-GW over MAP or IMS, the terminating SMS-GW shall do the following:

a. if the "SMDPP INVOKE" message was received over IMS:

1. send a SIP "202 Accepted" response to the originating SMS-GW according to [RFC 3428];

2. generate an "SMDPP RETURN RESULT" message towards the originating SMS-GW over IMS as described in section 7.3.3.5.4.1.

b. If the "SMDPP INVOKE" message was received over MAP, generate an "SMDPP RETURN RESULT" over MAP as specified in [MAP].

c. process the contents of the SMS message as defined in [MAP] and [C.S0015]. If the SMS message was received over IMS, the SMS-GW shall extract the SMS message from the body of the SIP MESSAGE.

d. determine whether it is responsible for SMS message deliveries to the destined UE. If yes, proceed to step c. Otherwise, return an appropriate error response back to the originating SMS-GW.

e. determine the preferred domain over which the SMS needs to be delivered to the UE:

1. if the preferred domain is IMS and the UE is registered over IMS, the SMS-GW shall follow the procedures defined in section 7.3.3.4.1 for delivering SMS messages over IMS.

2. if the preferred domain is 1x CS and the UE is registered in the 1x CS, the SMS-GW shall follow the procedures defined in [MAP] for delivering SMS messages to the UE over 1x CS.

3. if the UE is not registered in the preferred domain, based on operator policy, the SMS-GW may try to deliver the SMS message over other non-preferred domains, using the appropriate mechanisms and procedures specific to that domain.

7.3.3.4.1   Delivering SMS message to SMS-over-IMS receiver over IMS

When an SMS-GW wants to deliver an SMS message to an UE registered over IMS, the SMS GW shall construct a SIP MESSAGE with the following information:

a. the Request-URI shall be set to the tel URI or SIP URI of the UE to which the message needs to be delivered.

b. the Request-Disposition header shall contain the "no-fork" directive.

c. the Content-Type header shall be set to "application/vnd.3gpp2.sms".

d. the body of the request shall contain an SMS "Deliver" message, including the SMS Transport layer and SMS Teleservice layer information, as defined in [C.S0015] and encoded in binary. The SMS-over-IMS sender shall set the value of the Content-Transfer-Encoding header to "binary".

e. the P-Asserted-Identity shall contain the SIP URI of the SMS-GW.

Upon receiving a SIP 2xx response from the UE, the SMS-GW shall do the following:

a. If the SMS-GW had included a "Bearer Reply Option" in the Transport layer of the SMS message delivered to the UE, the SMS-GW shall wait for an SMS "Acknowledge" message from the UE before proceeding to step b. Otherwise, proceeds to step c.

b. Upon receiving an SMS "Acknowledge" message from the UE, the SMS-GW shall generate a SIP response according to [RFC 3428] and process the SMS "Acknowledge" message according to [C.S0015].

c. If the SMS message delivered to the UE contained a "Reply Option" with the "DAK_REQ" field set to 1, the SMS GW shall generate an SMS "Delivery Acknowledgment" message, as specified in [C.S0015], and send it towards the originator of the SMS message using the procedures specified in [MAP] or the procedures specified in section 7.3.3.5.4.1 over IMS.

7.3.3.5   SMS-GW to SMS-GW Communication

7.3.3.5.1   Terminating SMS-GW discovery procedure

Upon receiving an SMS message submitted by the SMS-over-IMS sender either over the 1x CS or IMS domain , the originating SMS-GW will determine whether to forward the SMS message to the terminating SMS-GW using the MAP or IMS.

If the originating SMS-GW decides to forward the submitted SMS message to a terminating SMS-GW over IMS, it must either obtain the SIP URI of the SMS-over-IMS receiver or discover the IP address of the terminating SMS-GW.

The originating SMS-GW obtains the SIP URI of the SMS-over-IMS receiver by translating the E.164 number of the SMS-over-IMS receiver into a globally routable SIP URI that resolves to the SMS-over-IMS receiver. This specification does not mandate any particular mechanism for implementing the translation of the E.164 number into the SIP URI of the SMS-over-IMS receiver. The originating SMS-GW may resolve the E.164 number into the SIP URI of the SMS-over-IMS receiver using any available database or any public or private ENUM/DNS translation mechanism (as specified in [RFC 3761]). Databases aspects of ENUM are outside the scope of this document. However, once the originating SMS-GW acquires the SIP URI of the SMS-over-IMS receiver, it will discover the entry point (I-CSCF) of the IMS subsystem hosting the SMS-over-IMS receiver and follow the procedures specified in [MMD Part-4] to route the SIP MESSAGE carrying the encapsulated SMS message.

Alternatively, the origination SMS-GW discovers the IP address of the terminating SMS-GW by translating the E.164 number of the SMS-over-IMS receiver into a globally routable SIP URI that resolves to the terminating SMS-GW. This specification does not mandate any particular mechanism for implementing the translation of the E.164 number into the FQDN of the terminating SMS-GW. The originating SMS-GW may resolve the E.164 number into the SIP URI of the terminating SMS-GW using any available database or any public or private ENUM/DNS translation mechanism (as specified in [RFC 3761]). Databases aspects of ENUM are outside the scope of this document. However, once the originating SMS-GW acquires the FQDN of the terminating SMS-GW, it will obtain the IP address of the terminating SMS-GW by accessing the global DNS infrastructure. Hence, the global DNS will be populated with the FQDN of the terminating SMS-GW and the associated IP address (i.e. with AAAA and A resource records).

The originating SMS-GW shall send the SIP MESSAGE to terminating SMS-GW according to the procedures defined in [RFC 3263].

If the originating SMS-GW decides to forward the submitted SMS message to a terminating SMS-GW over MAP, or if the originating SMS-GW fails to discover the terminating SMS-GW serving the SMS-over-IMS receiver over IMS, it shall deliver the SMS message(s) to the terminating SMS-GW using the SMDPP procedures defined in [MAP].

7.3.3.5.2 Routing the SIP MESSAGE to terminating SMS-GW over IMS

This section is applicable if the origination SMS-GW resolves the E.164 number of the SMS-over-IMS receiver into the IP address of the terminating SMS-GW.

The document [MMD Part-2], section 5.4.12.3, specifies the IMS procedure for the terminating AS hosting the subdomain PSI. In this document the SMS-GW assumes the role of the AS and the SIP URI of the SMS-GW shall be the subdomain PSI.

There are two ways to route the SIP MESSAGEs that contains the submitted SMS message from the originating SMS-GW to the terminating SMS-GW (i.e. the terminating AS) over IMS. When the originating SMS-GW queries the global DNS to resolve the FQDN of the terminating SMS-GW, it will obtain the IP address of either:

a. the terminating SMS-GW, in which case, the SIP MESSAGE is routed directly to the terminating SMS-GW; or

b. the entry point (i.e. the I-CSCF) of the IMS subsystem hosting the terminating SMS-GW. In this case. The SIP MESSAGE is routed to the I-CSCF. The I-CSCF recognizes the FQDN of the terminating SMS-GW as specified in the Request-URI and consequently does not query the HSS to obtain the address of the S-CSCF serving the target SMS-over-IMS receiver. The I-CSCF resolves the FQDN to the address of the terminating SMS-GW (i.e. the destination AS hosting the PSI) using an internal database

(e.g. private DNS), and forwards the requests directly to the terminating SMS-GW bypassing the S-CSCF.

The IMS network operator hosting the terminating SMS-GW selects which method it will be use by populating the global DNS either as specified in step a or b. If b is selected IMS network operator has to ensure that the I-CSCF has access to an internal database (e.g. private DNS) that is configured with the IP address of the terminating SMS-GW.

7.3.3.5.3   Procedures at the originating SMS-GW

When the originating SMS-GW decides to forward the received SMS "Submit" message to the terminating SMS-GW serving the SMS receiver over the IMS, the originating SMS-GW shall:

1. discover the IP address of terminating SMS-GW or the SIP URI of the SMS-over-IMS receiver as described in section 7.3.3.5.1;

2. construct a SIP MESSAGE with the following information:

    ▪   Request-URI shall be set to the SIP URI of the terminating SMS-GW or the SIP URI of the SMS-over-IMS receiver, which is obtained by resolving the E.164 number of the SMS-over-IMS receiver as specified in section 7.3.3.5.1;

    ▪   To header shall contain the same URI used in the Request-URI;

    ▪   From header shall contain the tel URI or SIP URI of the SMS-over-IMS sender;

    ▪   P-Asserted-Identity header shall contain the SIP URI of the originating SMS-GW;

    ▪   P-Charging-Vector header shall contain the parameters populated as specified in [MMD Part-4];

NOTE: The orig-ioi identifies the network operator from which the SIP MESSAGE was sent;

    ▪   Request-Disposition header shall contain the "no-fork" directive;

    ▪   Content-Type header shall be set to application/vnd.3gpp2.tcap;version="ANSI T1.114-1988" [MIME-TCAP]; and

    ▪   The body of the request shall be a TCAP message [TCAP] encoded in binary and contain an "SMDPP INVOKE" message as specified in [MAP], which includes the SMS "Submit" message received from the SMS-over-IMS sender. The SMS-GW shall also set the value of the Content-Transfer-Encoding header to "binary"; and

3. forward the SIP MESSAGE to the terminating SMS-GW as specified in section 7.3.3.5.1.

If the SIP MESSAGE sent by the originating SMS-GW to the terminating SMS-GW included the SMS "Submit" message with a "Reply Option" with the "DAK_REQ" set to 1 as specified in [C.S0015], the originating SMS-GW will subsequently receive from the terminating SMS-GW a SIP MESSAGE that contains the SMS delivery acknowledgement as specified in [C.S0015].

When the originating SMS-GW receives a SIP MESSAGE that contains the SMS "Delivery Acknowledgment" message as specified in [C.S0015] in the "SMDPP INVOKE" payload of the message, the originating SMS-GW shall:

1. send a SIP 202 Accepted to the terminating SMS-GW according to [RFC 3428];

2.   generate an "SMDPP RETURN RESULT" message towards the terminating SMS-GW as described in section 7.3.3.5.4.1.

3.   extract the SMS Delivery Acknowledgement from the payload of the received SIP MESSAGE;

4.   forward the SMS delivery acknowledgement to the SMS-over-IMS sender as described in section 7.3.3.3.2.

7.3.3.5.4   Procedures at the terminating SMS-GW

Upon receiving the SIP MESSAGE with an "SMDPP INVOKE" message containing an SMS "Submit" message from the originating SMS-GW over IMS, the terminating SMS-GW that serves the SMS receiver shall:

1.   send a SIP 202 Accepted to the originating SMS-GW according to [RFC 3428];

2.   process the SMS Point-to-Point message received in SIP MESSAGE;

3.   save the SIP URI of the originating SMS-GW, contained in the P-Asserted-Identity header of the received SIP MESSAGE, and bind it to the tel URI of the SMS-over-IMS sender; and

NOTE: The terminating SMS-GW will use the SIP URI of the originating SMS-GW when sending the SMS delivery acknowledgement to the originating SMS-GW.

4.   generate an "SMDPP RETURN RESULT" message towards the originating SMS-GW as described in section 7.3.3.5.4.1.

5.   deliver the submitted SMS message to the SMS-over-IMS receiver either over the IMS or 1x CS as described in section 7.3.1.4.

6.   if the SMS message contained a "Reply Option" with the "DAK_REQ" field set to 1, send a "Delivery Acknowledgement" message as described in section 7.3.3.5.4.1.

7.3.3.5.4.1   Procedures at terminating SMS-GW for sending SMDPP RETURN RESULT message or an SMDPP INVOKE message containing an SMS "Delivery Acknowledgement" message over IMS.

When the terminating SMS-GW needs to send an "SMDPP RETURN RESULT" message or an "SMDPP INVOKE" message containing an SMS "Delivery Acknowledgement" message to the originating SMS-GW over IMS, the terminating SMS-GW shall do the following:

1.   construct a SIP MESSAGE with the following information:

▪   Request-URI shall be set to the SIP URI of the originating SMS-GW that was saved and bound to the tel URI of the SMS-over-IMS sender (as indicated above);

▪   To header shall contain the same URI used in the Request-URI;

▪   From header shall contain the tel URI or SIP URI of the SMS-over-IMS receiver;

▪   P-Asserted-Identity header shall contain the SIP URI of the terminating SMS-GW;

▪   P-Charging-Vector header shall contain the parameters populated as specified in [MMD Part-4];

NOTE: The orig-ioi identifies the network operator from which the SIP MESSAGE was sent.

▪   Request-Disposition header shall contain the "no-fork" directive;

- Content-Type header shall be set to application/vnd.3gpp2.tcap;version="ANSI T1.114-1988"; and

- the body of the request shall be a TCAP message [TCAP] encoded in binary format and contain either an "SMDPP INVOKE" message constructed as specified in [MAP], carrying an SMS "Delivery Acknowledgement" message [C.S0015], or an "SMDPP RETURN RESULT" message constructed as specified in [MAP]. The SMS-GW shall also set the value of the Content-Transfer-Encoding header to "binary"; and

2. resolve the saved the SIP URI of the originating SMS-GW saved from step 3 in section 7.3.3.5.4;

3. forward the SIP MESSAGE to the IP address and port number of the originating SMS-GW as specified in section 7.3.3.5.1.