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Contents

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

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1 Scope

The present document provides the protocol details for SMS over IP within the IP Multimedia (IM) Core Network (CN) subsystem based on the Session Initiation Protocol (SIP) and SIP Events as defined in 3GPP TS 24.229 [10].

The present document provides the protocol details for SMS over IP within the IP Multimedia (IM) Core Network (CN) subsystem based on the SMS layer as defined in 3GPP TS 24.011 [8].

Where possible the present document specifies the requirements for this protocol by reference to specifications produced by the IETF within the scope of SIP and SIP Events, either directly, or as modified by 3GPP TS 24.229 [10].

The present document is applicable to Application Servers (ASs) and User Equipment (UE) providing SMS over IP functionality.

2 References

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

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 23.002: "Network Architecture".

[3] 3GPP TS 23.040: "Technical realization of the Short Message Service (SMS)".

[4] 3GPP TS 23.140: "Multimedia Messaging Service (MMS); Functional description; Stage 2".

[5] 3GPP TS 23.204: "Support of SMS over generic 3GPP IP access; Stage 2".

[6] 3GPP TS 23.218: "IP Multimedia (IM) session handling; IM call model; Stage 2".

[7] 3GPP TS 23.228: "IP Multimedia Subsystem (IMS); Stage 2".

[8] 3GPP TS 24.011: "Point-to-Point (PP) Short Message Service (SMS) support on mobile radio interface".

[8A] 3GPP TS 24.167: "3GPP IMS Management Object (MO)".

[9] 3GPP TS 24.228 Release 5: "Signalling flows for the IP multimedia call control based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3".

[10] 3GPP TS 24.229: "Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3".

[11] 3GPP TS 29.002: "Mobile Application Part (MAP) specification".

[12] RFC 3261 (June 2002): "SIP: Session Initiation Protocol".

[13] RFC 3325 (November 2002): "Private Extensions to the Session Initiation Protocol (SIP) for Asserted Identity within Trusted Networks".

[14] RFC 3428 (December 2002): "Session Initiation Protocol (SIP) Extension for Instant Messaging".

[15] RFC 3680 (March 2004): "A Session Initiation Protocol (SIP) Event Package for Registrations".

[16] RFC 3840 (August 2004): "Indicating User Agent Capabilities in the Session Initiation Protocol (SIP)".

[17] RFC 3841 (August 2004): "Caller Preferences for the Session Initiation Protocol (SIP)".

[18] 3GPP TS 31.103: "Characteristics of the IP Multimedia Services Identity Module (ISIM) Application".

[19] 3GPP TS 31.102: "Characteristics of the Universal Subscriber Identity Module (USIM) Application".

[20] 3GPP TS 51.011 Release 4: "Specification of the Subscriber Identity Module, Mobile Equipment (SIM - ME) interface".

[21] 3GPP TS 31.111: "Universal Subscriber Identity Module (USIM) Application Toolkit (USAT)".

[22] 3GPP TS 23.003: "Numbering, addressing and identification".

[23] 3GPP TS 29.311: "Service Level Interworking (SLI) for messaging services".

[24] RFC 6809 (November 2012): "Mechanism to Indicate Support of Features and Capabilities in the Session Initiation Protocol (SIP)".

[25] RFC 5621 (September 2009): "Message Body Handling in the Session Initiation Protocol (SIP)".

[26] RFC 4288 (December 2005): "Media Type Specifications and Registration Procedures".

[27] RFC 6665 (July 2012): "SIP-Specific Event Notification".

[28] 3GPP TS 22.011: "Service accessibility".

[29] 3GPP TS 23.221: "Architectural requirements".

[30] 3GPP TS 24.216: "Communication Continuity Management Object (MO)".

[31] 3GPP TS 23.122: "Non-Access-Stratum functions related to Mobile Station (MS) in idle mode".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

MSISDN less operation: Operation of SMS over IP for subscriber without MSISDN in the subscription profile as defined in 3GPP TS 23.204 [5] in clause 6.0a.

SM-over-IP sender: the A party that sends an SM using a SIP MESSAGE request including a vnd.3gpp.sms payload (introduced in 3GPP TS 23.140 [4]).

SM-over-IP receiver: the B party that receives an SM encapsulated in the vnd.3gpp.sms payload of a SIP MESSAGE request.

For the purposes of the present document, the following terms and definitions given in RFC 3261 [12] apply.

Header
Header field
Method
Request
Response
(SIP) transaction
Status-code (see RFC 3261 [12], clause 7.2)
Tag (see RFC 3261 [12], clause 19.3)

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.002 [2], clauses 4.1.1.1 and 4a.7 apply:

Call Session Control Function (CSCF)
Home Subscriber Server (HSS)

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.218 [6], clause 3.1 apply:

Filter criteria
Initial filter criteria

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.228 [7], clauses 4.3.3.1, 4.3.6 and 4.6 apply:

Interrogating-CSCF (I-CSCF)
Public Service Identity (PSI)
Proxy-CSCF (P-CSCF)
Serving-CSCF (S-CSCF)

For the purposes of the present document, the following terms and definitions given in 3GPP TS 22.011 [28] apply:

3GPP PS data off
3GPP PS data off exempt service

For the purposes of the present document, the following terms and definitions given in 3GPP TS 24.229 [10] apply:

3GPP PS data off status

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.122 [31] apply:

Equivalent Home PLMN (EHPLMN)
Home PLMN (HPLMN)
Visited PLMN (VPLMN)

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1], TS 23.040 [3] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

AS	Application Server
IP-SM-GW	IP-Short-Message-Gateway
PS	Packet Switched

4 Overview of SMS over IP functionality

4.1 Introduction

SMS over IP functionality provides the UE with the capability of sending traditional short messages over IMS network. The architecture for SMS is specified in 3GPP TS 23.040 [3] and for SMS over IP functionality in 3GPP TS 23.204 [5].

4.2 SMS over IP

In order to guarantee SMS interoperability the SM-over-IP sender, the SM-over-IP receiver and the IP-SM-GW shall support encapsulation of RPDUs defined in 3GPP TS 24.011 [8], clause 7.3. The SM-over-IP sender, the SM-over-IP receiver and the IP-SM-GW shall use the MIME type "application/vnd.3gpp.sms" for this purpose.

4.3 Application utilisation of SMS over IP

SMS over generic IP access can be used to support all applications and services that use SMS.

4.4 SMS over IP and subscription without MSISDN

When SMS over IP is to be delivered to a subscriber where the subscription profile does not contain an MSISDN, then there is a need for the IP-SM-GW to become aware of the IMSI during IMS registration for later correlation of short messages. In order to do so the IP-SM-GW derives the IMSI from the private user identity of the user that the UE includes in the REGISTER request at registration or if the private user identity is not available, derives the IMSI from the public user identity.

3GPP TS 23.003 [22] defines the relationship between the private user identity and the IMSI and the relationship between the public user identity and the IMSI.

5 SIP related procedures

5.1 Introduction

5.2 Functional entities

5.2.1 User Equipment (UE)

5.2.1.1 General

To be compliant with short message over IP in this document, a UE shall implement:

a) the role of an SM-over-IP sender as specified in clause 5.3.1.1, clause 5.3.1.2, and clause 5.3.1.3;

b) the role of an SM-over-IP receiver as specified in clause 5.3.2.1, clause 5.3.2.2, clause 5.3.2.3, clause 5.3.2.4, and clause 5.3.2.5; or

c) the roles described in item a) and item b).

To be compliant with short message over IP in MSISDN less operation in this document, a UE shall implement:

a) the role of an SM-over-IP sender as specified in clause 5.3.1.4.1, clause 5.3.1.4.2, and clause 5.3.1.4.3;

b) the role of an SM-over-IP receiver as specified in clause 5.3.2.6.1, clause 5.3.2.6.2, clause 5.3.2.6.3, and clause 5.3.2.6.4; or

c) the roles described in item a) and item b).

NOTE: The capability of sending short messages over IP does not affect current limitations, thus the UE is limited to send at most one UE originated SM and to receive at most one UE terminated SM at a time.

5.2.1.2 Configuration

Parameters such as the PSI of the SC of the SM-over-IP sender can be obtained from the UICC as per 3GPP TS 31.103 [18] and 3GPP TS 31.102 [19] if used or from the SIM as per 3GPP TS 51.011 [20] if used.

5.2.1.3 Policy enforcement

The network operator's preference for selection of the domain to be used for short message service originated by the UE indicates the domain for originating short messages.

The network operator's preference for selection of the domain to be used for short message service originated by the UE can be set to one of the following values:

a) the SMS service is not to be invoked over the IP networks; and

b) the SMS service is preferred to be invoked over the IP networks.

The UE shall support the network operator's preference for selection of the domain to be used for short message service originated by the UE.

The UE may support being configured with the network operator's preference for selection of the domain to be used for short message service originated by the UE in the SMS_Over_IP_Networks_Indication of 3GPP TS 24.167 [8A].

Editor's note [CR#0086, IOC_UE_conf]: Handling of any configuration on UICC related to the network operator's preference for selection of the domain to be used for short message service originated by the UE is FFS.

If the network operator's preference for selection of the domain to be used for short message service originated by the UE is set to "the SMS service is not to be invoked over the IP networks", the UE shall not perform the procedures in clause 5.3.1.

The policy on usage of SMS over IP indicates when the UE is allowed to use SMS over IP.

The policy on usage of SMS over IP can be set to one of the following values:

a) SMS over IP is used only if voice over PS is available and only on the IP-CAN bearer that is used for the transport of SIP signalling associated with voice over PS;

b) SMS over IP is used only if voice over PS is available and on any IP-CAN bearer; and

c) SMS over IP is used irrespective of whether voice over PS is available and on any IP-CAN bearer.

The UE may support the policy on usage of SMS over IP.

If the UE supports the policy on usage of SMS over IP and the network operator's preference for selection of the domain to be used for short message service originated by the UE is set to "the SMS service is preferred to be invoked over the IP networks":

a) the UE may support being configured with SMSoIP usage policy using one or more of the following methods:

   1) the SMSoIP usage policy leaf of the $EF_{IMSConfigData}$ file described in 3GPP TS 31.102 [19];

   2) the SMSoIP usage policy leaf of the $EF_{IMSConfigData}$ file described in 3GPP TS 31.103 [18]; and

   3) the SMSoIP usage policy leaf of 3GPP TS 24.167 [8A].

   If the UE is configured with both the SMSoIP usage policy leaf of 3GPP TS 24.167 [8A] and the SMSoIP usage policy leaf of the $EF_{IMSConfigData}$ file described in 3GPP TS 31.102 [19] or the SMSoIP usage policy leaf of the $EF_{IMSConfigData}$ file described in 3GPP TS 31.103 [18], then the SMSoIP usage policy leaf of the $EF_{IMSConfigData}$ file shall take precedence.

NOTE 1: Precedence for files configured on both the USIM and ISIM is defined in 3GPP TS 31.103 [18].

b) if the policy on usage of SMS over IP is set to "SMS over IP is used only if voice over PS is available and only on the IP-CAN bearer that is used for the transport of SIP signalling associated with voice over PS":

   1) if the domain selection for originating voice calls specified in 3GPP TS 23.221 [29] determines that the UE does not use the IMS to originate voice call then the UE shall not perform the procedures in clause 5.3.1 and clause 5.3.2 and determines that SMS over IP is restricted (see 3GPP TS 24.229 [10]); and

   2) if:

      A) the domain selection for originating voice calls specified in 3GPP TS 23.221 [29] determines that the UE uses the IMS to originate voice calls;

      B) the UE supports multiple registrations as specified in 3GPP TS 24.229 [10];

      C) the UE registered several registration flows; and

D) at least one of the registration flow was registered via an IP-CAN different than the remaining registration flows;

then the UE shall not perform the procedures in clause 5.3.1 and clause 5.3.2 and determines that SMS over IP is restricted (see 3GPP TS 24.229 [10]) over access technology where the audio is restricted or not preferred according to 3GPP TS 24.216 [30]; and

c) if the policy on usage of SMS over IP is set to "SMS over IP is used only if voice over PS is available and on any IP-CAN bearer" and the domain selection for originating voice calls specified in 3GPP TS 23.221 [29] determines that the UE does not use the IMS to originate voice call then the UE shall not perform the procedures in clause 5.3.1 and clause 5.3.2 and determines that SMS over IP is restricted (see 3GPP TS 24.229 [10]).

NOTE 2: If the network operator's preference for selection of the domain to be used for short message service originated by the UE is set to "the SMS service is not to be invoked over the IP networks", the policy on usage of SMS over IP has no effect.

NOTE 3: If the policy on usage of SMS over IP is set to "SMS over IP is used irrespective of whether voice over PS is available and on any IP-CAN bearer", there is no restriction regarding how SMS over IP is used.

5.2.2 Application Server (AS)

To be compliant with short message over IP in this document, an AS shall implement the role of an IP-SM-GW as specified in clause 5.3.3.1, clause 5.3.3.2, clause 5.3.3.3, and clause 5.3.3.4.

To be compliant with short message over IP in MSISDN less operation in this document, an AS shall implement the role of an IP-SM-GW as specified in clause 5.3.3.1, clause 5.3.3.2, clause 5.3.3.3, and clause 5.3.3.5.

5.3 Roles

5.3.1 SM-over-IP sender

5.3.1.1 General

In addition to the procedures specified in clause 5.3.1, the SM-over-IP sender shall support the procedures specified in 3GPP TS 24.229 [10] appropriate to the functional entity in which the SM-over-IP sender is implemented. The SM-over-IP sender shall build and populate RP-DATA message, containing all the information that a mobile station submitting an SM according to 3GPP TS 24.011 [8] would place, for successful delivery. The SM-over-IP sender shall parse and interpret RP- DATA, RP-ACK and RP-ERROR messages, containing all the information that a mobile station receiving an SM according to 3GPP TS 24.011 [8] would see, in a SM submission or status report.

NOTE 1: If the SM-over-IP sender uses SMR entity timers as specified in 3GPP TS 24.011 [8], then TR1M is set to a value greater than timer F (see 3GPP TS 24.229 [10]).

NOTE 2: If the SM-over-IP sender expects to receive a SM submit report will include the "+g.3gpp.smsip" parameter in the Contact header field when sending a REGISTER request.

5.3.1.2 Submitting a short message

When an SM-over-IP sender wants to submit an SM over IP, the SM-over-IP sender shall send a SIP MESSAGE request with the following information:

a) the Request-URI, which shall contain the PSI of the SC of the SM-over-IP sender;

NOTE 1: The PSI of the SC can be SIP URI or tel URI based on operator policy. The PSI of the SC can be obtained using one of the following methods in the priority order listed below:

1) provided by the user;

2) if UICC is used, then:

- if an ISIM is present, then the PSI of the SC is obtained from the $EF_{PSISMSC}$ in DF_TELECOM as per 3GPP TS 31.103 [18];

- if an ISIM is not present, then the PSI of the SC is obtained from the $EF_{PSISMSC}$ in DF_TELECOM as per 3GPP TS 31.102 [19]; or

- if the PSI of the SC is not available in $EF_{PSISMSC}$ in DF_TELECOM, then the PSI of the SC contains the TS-Service-Centre-Address stored in the EF_{SMSP} in DF_TELECOM as per 3GPP TS 31.102 [19]. If the PSI of the SC is based on the E.164 number from the TS-Service-Centre-Address stored in the EF_{SMSP} in DF_TELECOM then the URI constructed can be either a tel URI or a SIP URI (using the "user=phone" SIP URI parameter format).

3) if SIM is used instead of UICC, then the PSI of the SC contains the TS-Service Centre Address stored in the EF_{SMSP} in DF_TELECOM as per 3GPP TS 51.011 [20]. If the PSI of the SC is based on the E.164 number from the TS-Service-Centre-Address stored in the EF_{SMSP} in DF_TELECOM then the URI constructed can be either a tel URI or a SIP URI (using the "user=phone" SIP URI parameter format); or

4) if neither the UICC nor SIM is used, then how the PSI of the SC is configured and obtained is through means outside the scope of this specification.

b) the From header, which shall contain a public user identity of the SM-over-IP sender;

NOTE 2: The IP-SM-GW will have to use an address of the SM-over-IP sender that the SC can process (i.e. an E.164 number). This address will come from a tel URI in a P-Asserted-Identity header (as defined in RFC 3325 [13]) placed in the SIP MESSAGE request by the P-CSCF or S-CSCF.

NOTE 3: The SM-over-IP sender has to store the Call-ID of the SIP MESSAGE request, so it can associate the appropriate SIP MESSAGE request including a submit report with it.

c) the To header, which shall contain the PSI of the SC of the SM-over-IP sender;

d) the Content-Type header, which shall contain "application/vnd.3gpp.sms"; and

e) the body of the request shall contain an RP-DATA message as defined in 3GPP TS 24.011 [8], including the SMS headers and the SMS user information encoded as specified in 3GPP TS 23.040 [3].

NOTE 4: The address of the SC is included in the RP-DATA message content. The address of the SC included in the RP-DATA message content is stored in the EF_{SMSP} in DF_TELECOM of the (U)SIM of the SM-over-IP sender.

NOTE 5: The SM-over-IP sender will use content transfer encoding of type "binary" for the encoding of the SM in the body of the SIP MESSAGE request.

NOTE 6: Both the address of the SC and the PSI of the SC can be configured in the $EF_{PSISMSC}$ in DF_TELECOM of the USIM and ISIM respectively using the USAT as per 3GPP TS 31.111 [21].

The SM-over-IP sender may request the SC to return the status of the submitted message. The support of status report capabilities is optional for the SC.

When a SIP MESSAGE request including a submit report in the "vnd.3gpp.sms" payload is received, the SM-over-IP sender shall:

- if SM-over-IP sender supports In-Reply-To header usage and the In-Reply-To header indicates that the request corresponds to a short message submitted by the SM-over-IP sender, generate a 200 (OK) SIP response according to RFC 3428 [14].

  if SM-over-IP sender supports In-Reply-To header usage and the In-Reply-To header indicates that the request does not correspond to a short message submitted by the SM-over-IP sender, a 488 (Not Acceptable here) SIP response according to RFC 3428 [14].

- if SM-over-IP sender does not support In-Reply-To header usage, generate a 200 (OK) SIP response according to RFC 3428 [14]; and extract the payload encoded according to 3GPP TS 24.011 [8] for RP-ACK or RP-ERROR.