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TECHNICAL SPECIFICATION

Universal Mobile Telecommunications System (UMTS);
LTE;
5G;
Diameter based protocols to support Short Message
Service (SMS) capable Mobile Management Entities (MMEs)
(3GPP TS 29.338 version 17.1.0 Release 17)

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650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00   Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - APE 7112B
Association à but non lucratif enregistrée à la
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Contents

Foreword

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

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y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

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In the present document, modal verbs have the following meanings:

shall   indicates a mandatory requirement to do something

shall not   indicates an interdiction (prohibition) to do something

The constructions "shall" and "shall not" are confined to the context of normative provisions, and do not appear in Technical Reports.

The constructions "must" and "must not" are not used as substitutes for "shall" and "shall not". Their use is avoided insofar as possible, and they are not used in a normative context except in a direct citation from an external, referenced, non-3GPP document, or so as to maintain continuity of style when extending or modifying the provisions of such a referenced document.

should   indicates a recommendation to do something

should not   indicates a recommendation not to do something

may   indicates permission to do something

need not   indicates permission not to do something

The construction "may not" is ambiguous and is not used in normative elements. The unambiguous constructions "might not" or "shall not" are used instead, depending upon the meaning intended.

can   indicates that something is possible

cannot   indicates that something is impossible

The constructions "can" and "cannot" are not substitutes for "may" and "need not".

will   indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

will not   indicates that something is certain or expected not to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

might   indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

    might not   indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

In addition:

    is   (or any other verb in the indicative mood) indicates a statement of fact

    is not   (or any other negative verb in the indicative mood) indicates a statement of fact

The constructions "is" and "is not" do not indicate requirements.

1   Scope

The present document defines the Diameter-based interfaces specific to SMS when they are used in conjunction with the "SMS in MME" architecture specified in 3GPP TS 23.272 [2] or for SGSN supporting EPS interfaces, or the" SMS in 5GS" architecture specified in 3GPP TS 23.501 [21]. It comprises:

- the Diameter application for the S6c interface between the HSS/UDM and the central SMS functions (SMS-GMSC, SMS Router) ;

- the Diameter application

  - for the SGd interface between the MME/SMSF, the SMS-IWMSC, the SMS-GMSC and the SMS Router.

  - for the Gdd interface between the SGSN, the SMS-IWMSC, the SMS-GMSC and the SMS Router.

For the purpose of supporting SMS in 5GS, the UDM may implement the requirements specified in the present specification for HSS, with the following modification:

- "HSS" is to be replaced with "UDM".

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 23.272: "Circuit Switched (CS) fallback in Evolved Packet System (EPS); Stage 2".

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

[4]   3GPP TS 29.272: "Evolved Packet System (EPS); Mobility Management Entity (MME) and Serving GPRS Support Node (SGSN) related interfaces based on Diameter protocol".

[5]   3GPP TS 29.229: "Cx and Dx interfaces based on the Diameter protocol; Protocol details".

[6]   IETF RFC 2234: "Augmented BNF for Syntax Specifications: ABNF".

[7]   Void.

[8]   IETF RFC 5516: "Diameter Command Code Registration for the Third Generation Partnership Project (3GPP) Evolved Packet System (EPS)".

[9]   3GPP TS 29.002: "Mobile Application Part (MAP) specification".

[10]   3GPP TS 29.173: "Location Services (LCS); Diameter-based SLh interface for Control Plane LCS".

[11]   3GPP TS 33.210: "3G security; Network Domain Security (NDS); IP network layer security ".

[12]   IETF RFC 4960: "Stream Control Transport Protocol".

[13]   ITU-T Recommendation E.164: "The international public telecommunication numbering plan".

[14]   3GPP TS 29.329: "Sh Interface based on the Diameter protocol; Protocol details".

[15]   3GPP TS 29.336: "Home Subscriber Server (HSS) diameter interfaces for interworking with packet data networks and applications".

[16]   3GPP TS 23.003: "Numbering, addressing and identification".

[17]   3GPP TS 23.204: "Support of Short Message Service (SMS) over generic 3GPP Internet Protocol (IP) access; Stage 2".

[18]   3GPP TS 23.682: "Architecture enhancements to facilitate communications with packet data networks and applications".

[19]   IETF RFC 7944: "Diameter Routing Message Priority".

[20]   IETF RFC 6733: "Diameter Base Protocol".

[21]   3GPP TS 23.501:"System Architecture for the 5G System".

3   Definitions, symbols 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].

3.2   Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] 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].

ABNF	Augmented Backus-Naur Form
DRMP	Diameter Routing Message Priority
DSCP	Differentiated Services Code Point
IANA	Internet Assigned Numbers Authority
IP-SM-GW	IP Short Message Gateway
MWD	Message Waiting Data
RP	Relay layer Protocol
RP-MTI	RP Message Type Indicator
RP-SMEA	RP SME-Address
RP-UI	RP User Information
SM RL	Short Message Relay Layer
SMS-GMSC	Gateway MSC for SMS
SMS-IWMSC	Interworking MSC for SMS
SMSMI	SMS without MSISDN in IMS

4   General

4.1   Introduction

The SMS in MME architecture is described in 3GPP TS 23.272 [2] and the SMS in 5GS architecture is described in 3GPP TS 23.501 [21], have specified the reference points S6c and SGd.

The clause 4 addresses Diameter aspects which are common to S6c, SGd and Gdd.

4.2 Use of Diameter Base protocol

The Diameter base protocol as specified in IETF RFC 6733 [20] shall apply except as modified by the defined support of the methods and the defined support of the commands and AVPs, result and error codes as specified in this specification. Unless otherwise specified, the procedures (including error handling and unrecognised information handling) shall be used unmodified.

4.3 Securing Diameter messages

For secure transport of Diameter messages, see 3GPP TS 33.210 [11].

4.4 Accounting functionality

Accounting functionality (Accounting Session State Machine, related command codes and AVPs) shall not be used on the S6c, SGd and Gdd interfaces.

4.5 Use of sessions

Diameter sessions shall be implicitly terminated over the S6c, SGd and Gdd interfaces. An implicitly terminated session is one for which the server does not maintain state information. The client shall not send any re-authorization or session termination requests to the server.

The Diameter base protocol specified in IETF RFC 6733 [20] includes the Auth-Session-State AVP as the mechanism for the implementation of implicitly terminated sessions.

The client (server) shall include in its requests (responses) the Auth-Session-State AVP set to the value NO_STATE_MAINTAINED (1), as described in IETF RFC 6733 [20]. As a consequence, the server shall not maintain any state information about this session and the client shall not send any session termination request. Neither the Authorization-Lifetime AVP nor the Session-Timeout AVP shall be present in requests or responses.

4.6 Transport protocol

Diameter messages over the S6c, SGd and Gdd interfaces shall make use of SCTP as specified in IETF RFC 4960 [12] as transport protocol.

4.7 Advertising application support

The MME, HSS, SMS-IWMSC, SMS-GMSC and SMS Router shall advertise support of the Diameter S6c Application over the S6c interface and of the Diameter SGd Application over the SGd interface by including the value of the application identifier in the Auth-Application-Id AVP within the Vendor-Specific-Application-Id grouped AVP of the Capabilities-Exchange-Request and Capabilities-Exchange-Answer commands. The MME, SMS-GMSC and SMS Router shall additionally advertise support of the Diameter S6c Application over the SGd interface if they support the Alert Service Centre procedure between the MME, SMS-GMSC and SMS Router.

The SGSN, SMS-IWMSC, SMS-GMSC and SMS Router shall advertise support of the Diameter SGd Application over the Gdd interface by including the value of the application identifier in the Auth-Application-Id AVP within the Vendor-Specific-Application-Id grouped AVP of the Capabilities-Exchange-Request and Capabilities-Exchange-Answer commands. The SGSN, SMS-GMSC and SMS Router shall additionally advertise support of the Diameter S6c Application over the Gdd interface if they support the Alert Service Centre procedure between the SGSN, SMS-GMSC and SMS Router.

The MTC-IWF and SMS-IWMSC shall advertise support of the Diameter SGd Application over the T4 interface if they support the MO-Forward-Short-Message procedure between the SMS-IWMSC and the MTC-IWF.

The vendor identifier value of 3GPP (10415) shall be included in the Supported-Vendor-Id AVP of the Capabilities-Exchange-Request and Capabilities-Exchange-Answer commands, and in the Vendor-Id AVP within the Vendor-Specific-Application-Id grouped AVP of the Capabilities-Exchange-Request and Capabilities-Exchange-Answer commands.

The Vendor-Id AVP included in Capabilities-Exchange-Request and Capabilities-Exchange-Answer commands that is not included in the Vendor-Specific-Application-Id AVPs as described above shall indicate the manufacturer of the Diameter node as per IETF RFC 6733 [20].

4.8 Diameter Application Identifier

The S6c and the SGd/Gdd interface protocols shall be defined, each, as an IETF vendor specific Diameter application, where the vendor is 3GPP. The vendor identifier assigned by IANA to 3GPP (http://www.iana.org/assignments/enterprise-numbers) is 10415.

The Diameter application identifier assigned to the S6c Diameter application is 16777312 (allocated by IANA).

The Diameter application identifier assigned to the SGd Diameter application, which is also applicable to the Gdd and T4 interfaces is 16777313 (allocated by IANA).

4.9 Use of the Supported-Features AVP

When new functionality is introduced on the S6c or SGd Diameter applications, it should be defined as optional. If backwards incompatible changes can not be avoided, the new functionality shall be introduced as a new feature and support advertised with the Supported-Features AVP. The usage of the Supported-Features AVP on the S6c or SGd applications is consistent with the procedures for the dynamic discovery of supported features as defined in clause 7.2 of 3GPP TS 29.229 [5].

When extending the application by adding new AVPs for a feature, the new AVPs shall have the M bit cleared and the AVP shall not be defined mandatory in the command ABNF.

As defined in 3GPP TS 29.229 [5], the Supported-Features AVP is of type grouped and contains the Vendor-Id, Feature-List-ID and Feature-List AVPs. On the all reference points as specified in this specification, the Supported-Features AVP is used to identify features that have been defined by 3GPP and hence, for features defined in this document, the Vendor-Id AVP shall contain the vendor ID of 3GPP (10415). If there are multiple feature lists defined for the reference point, the Feature-List-ID AVP shall differentiate those lists from one another.

The Table 5.3.3.13/1 defines the features applicable to the S6c interface for the feature list with a Feature-List-ID of 1.

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5 Diameter based S6c interface between HSS and central SMS functions

5.1 Introduction

The S6c interface enables the retrieval of routing information for the transfer of short messages, the report of status of the delivery status of a short message and the alerting of the SMS-SC between the HSS, the SMS-GMSC and the SMS Router as described in 3GPP TS 23.040 [3].

5.2 Procedures description

5.2.1 Send Routing Info for SM procedure

5.2.1.1 General

This procedure shall be used between the SMS-GMSC or the IP-SM-GW and the HSS to retrieve the routing information needed for routing the short message to the serving MSC or MME or SGSN or SMSF. This procedure is also used between the SMS-GMSC and the SMS Router or the IP-SM-GW, and between the HSS and the SMS Router or the IP-SM-GW in order to enforce routing of the SM delivery via the HPLMN of the receiving MS.

This procedure is applicable to an IP-SM-GW for its SMS Router function when using the S6c interface.

This procedure is used according to the call flows described in 3GPP TS 23.040 [2] clause 10.

Table 5.2.1.1-1 specifies the involved information elements for the request.

Table 5.2.1.1-2 specifies the involved information elements for the answer.

This procedure is mapped to the commands Send-Routing-Info-for-SM-Request/Answer (SRR/SRA) in the Diameter application specified in clause 5.3.2.

Table 5.2.1.1-1: Send Routing Info for SM Request

Information element name	Mapping to Diameter AVP	Cat.	Description
MSISDN	MSISDN	C	This information element shall be present when the MSISDN exists and shall contain the MSISDN of the user.
IMSI	User-Name (See IETF RFC 6733 [20])	C	This information element shall be present when the MSISDN does not exist and shall contain - the IMSI of the user in the context of T4 device triggering (see 3GPP TS 23.682 [18]; - or the HSS ID value in the context of MSISDN-less SMS delivery in IMS (see 3GPP TS 23.204 [17]),.
SMSMI Correlation ID	SMSMI-Correlation-ID	C	This information element indicates by its presence that the request is sent in the context of MSISDN-less SMS delivery in IMS (see 3GPP TS 23.204 [17]). This information element shall contain the SIP-URI of the (MSISDN-less) destination user. The SIP-URI of the originating user and the HSS-ID shall be absent from this information element.
Service Centre Address	SC-Address	M	This information element shall contain the Service Centre address.
SM-RP-MTI	SM-RP-MTI	C	This information element shall contain the RP-Message Type Indicator of the Short Message. It is used to distinguish a SM sent to the mobile station in order to acknowledge an MO-SM initiated by the mobile from a normal MT-SM.
SM-RP-SMEA	SM-RP-SMEA	C	This information element shall contain the RP-Originating SME-address of the Short Message Entity that has originated the SM. This information element shall be present if the SMS-GMSC supports receiving of the two numbers from the HSS. Used by the short message service relay sub-layer protocol it shall be formatted according to the formatting rules of address fields as described in 3GPP TS 23 040 [2].
SRR Flags	SRR-Flags	C	This Information Element contains a bit mask. See 5.3.3.4 for the meaning of the bits and the condition for each bit to be set or not.
SM-Delivery Not Intended	SM-Delivery-Not-Intended	O	This information element, when present, shall indicate that delivery of a short message is not intended. It further indicates whether only IMSI or only MCC+MNC are requested. This information element may be set by entities that request the service without intending to deliver a short message, and shall be evaluated by the SMS Router and may be evaluated by the HSS.
Supported Features	Supported-Features (See 3GPP TS 29.229 [5])	O	If present, this Information Element shall contain the list of features supported by the origin host.

Table 5.2.1.1-2: Send Routing Info for SM Answer

Information element name	Mapping to Diameter AVP	Cat.	Description

Result	Result-Code / Experimental-Result	M	Result of the request.
			Result-Code AVP shall be used for errors defined in the Diameter base protocol (see IETF RFC 6733 [20]).
			Experimental-Result AVP shall be used for S6c errors. This is a grouped AVP which contains the 3GPP Vendor ID in the Vendor-Id AVP, and the error code in the Experimental-Result-Code AVP. This information element shall contain the result of the operation with an indication of the success / errors.
			The following errors are applicable in this case:
			   - Unknown User;
			   - Service Barred;
			   - Teleservice Not Provisioned;
			   - Absent User;
			   - Facility Not Supported.

IMSI	User-Name (See IETF RFC 6733 [20])	C	This information element:
			   - either shall contain the IMSI of the user.
			   - or, if enforcement of routing an SM via the HPLMN of the receiving MS or UE is deployed, shall contain an MT Correlation ID instead of an IMSI when the service is used between SMS-GMSC and SMS Router (see 3GPP TS 23.040 [2] for more information).
			   - or, if the "SM-Delivery-Not-Intended" Information Element was present in the request with a value of "only MCC+MNC requested", may contain MCC+MNC+dummy MSIN.
			This information element shall be present in a successful answer.
			This information element shall be present in an answer from the HSS to the IP-SM-GW, if an Absent User result is returned and the UNRI is not set.

Serving-Node	Serving-Node	C	If the "SM-Delivery-Not-Intended" Information Element was not present in the request, this information element shall contain the identity of one serving node on which the user is registered. This identity shall either be:
			   - the Diameter identity and the Diameter realm of the MME registered for MT SMS plus the E.164 number of the MME for MT SMS;
			   - or the ISDN number of the MSC;
			   - or the Diameter identity and the Diameter realm of the SGSN, if they are available, and the ISDN number of the SGSN,
			   - or the Diameter identity and the Diameter realm of the IP-SM-GW, if they are available, and the ISDN number of the IP-SM-GW;
			   - or the Diameter identity and the Diameter realm of the SMSF registered for 3GPP access, if they are available, and the E.164 number of the SMSF registered for 3GPP access;
			   - or the Diameter identity and the Diameter realm of the SMSF registered for non 3GPP access, if they are available, and the E.164 number of the SMSF registered for non 3GPP access.
			If the "SM-Delivery-Not-Intended" Information Element was present in the request, this information element may be absent.
			This information element shall be present in a successful answer.
			See NOTE.

LMSI	LMSI	C	The HSS shall include the LMSI in a successful response, if the VLR has used the LMSI and if there is the ISDN number of an MSC in the answer.

Additional Serving Node	Additional-Serving-Node	C	This information element, when present shall either contain: - the Diameter identity and the Diameter realm of the MME registered for MT SMS plus the E.164 number of the MME for MT SMS. - or the ISDN number of the MSC - or the Diameter identity and the Diameter realm of the SGSN, if they are available, and the ISDN number of the SGSN; - or the Diameter identity and the Diameter realm of the SMSF registered for 3GPP access, if they are available, and the E.164 number of the SMSF registered for 3GPP access; - or the Diameter identity and the Diameter realm of the SMSF registered for non 3GPP access, if they are available, and the E.164 number of the SMSF registered for non 3GPP access. It shall not contain information delivered in the Serving Node information element. See NOTE.
User Identifier Alert	User-Identifier	C	This information element shall contain the MSISDN stored in the HSS, when available.
MWD Status	MWD-Status	C	This Information Element is sent when appropriate and shall contain a bit mask. See 5.3.3.8 for the meaning of the bits.
MME Absent User Diagnostic SM	MME-Absent-User-Diagnostic-SM	C	This information element shall contain the reason of the absence of the user when given by the MME and stored in the HSS
MSC Absent User Diagnostic SM	MSC-Absent-User-Diagnostic-SM	C	This information element shall contain the reason of the absence of the user when given by the MSC and stored in the HSS
SGSN Absent User Diagnostic SM	SGSN-Absent-User-Diagnostic-SM	C	This information element shall contain the reason of the absence of the user when given by the SGSN and stored in the HSS
Supported Features	Supported-Features (See 3GPP TS 29.229 [5])	O	If present, this information element shall contain the list of features supported by the origin host.
SMSF 3GPP Address	SMSF-3GPP-Address	C	If the "SM-Delivery-Not-Intended" Information Element was not present in the request, this information element shall contain the identity of the registered SMSF for 3GPP access. If the "SM-Delivery-Not-Intended" Information Element was present in the request, this information element may be absent. See NOTE.
SMSF Non 3GPP Address	SMSF-Non-3GPP-Address	C	If the "SM-Delivery-Not-Intended" Information Element was not present in the request, this information element shall contain the identity of the registered SMSF or Non-3GPP access. If the "SM-Delivery-Not-Intended" Information Element was present in the request, this information element may be absent. See NOTE.
SMSF 3GPP Absent User Diagnostic SM	SMSF-3GPP-Absent-User-Diagnostic-SM	C	This information element shall contain the reason of the absence of the user when given by the SMSF registered for 3GPP access. See NOTE
SMSF Non 3GPP Absent User Diagnostic SM	SMSF-Non-3GPP-Absent-User-Diagnostic-SM	C	This information element shall contain the reason of the absence of the user when given by the SMSF registered for Non-3GPP access. See NOTE
NOTE:			If the feature "SMSF-Support" is not supported by the SMS-GMSC, IP-SM-GW, or SMS Router, the AVPs SMSF-3GPP-Address, SMSF-Non-3GPP-Address, SMSF-3GPP-Absent-User-Diagnostic and SMSF-Non-3GPP-Absent-User-Diagnostic shall not be present. In this case the SMSF 3GPP Address and/or the SMSF Non 3GPP Address may be populated in the existing Serving-Node and Additional-Serving-Node AVPs as applicable.

5.2.1.2 Detailed behaviour of the SMS-GMSC

The SMS-GMSC shall make use of this procedure to retrieve the routing information needed for routing the short message to the serving MSC or MME or SGSN or SMSF registered for 3GPP access or SMSF registered for non-3GPP access for enforcing routing of the SM delivery via the SMS Router of HPLMN.

It shall populate the information elements in the Send Routing Info for SM request according to the table 5.2.1.1-1.

When the Send Routing Info for SM Request is sent by the SMS-GMSC to the HSS in a retry context of SMS for IMS UE to IMS UE without MSISDN (see 3GPP TS 23.204 [17]), IMSI may not be available. In this case the IMSI information element shall be populated with the HSS-ID value.

When receiving the Send Routing Info for-SM Answer, the SMS-GMSC or the SMS Router shall use the received Diameter address if the SMS-GMSC or the SMS Router transfers the terminating short message over the SGd or the Gdd interface.

5.2.1.3 Detailed behaviour of the HSS

This clause describes the HSS behaviour when the HSS receives a Send Routing Info for SM request which is not forwarded to an SMS Router or an IP-SM-GW.

The HSS shall check if the user identified by the MSISDN is known; otherwise, the HSS shall return an Experimental-Result-Code set to DIAMETER_ERROR_USER_UNKNOWN.

The HSS shall check if a MT SMS Teleservice subscription exists; otherwise, the HSS shall return an Experimental-Result-Code set to DIAMETER_ERROR_SERVICE_NOT_SUBSCRIBED.

The HSS shall check if the user is not barred for receiving MT short messages; otherwise, the HSS shall return an Experimental-Result-Code set to DIAMETER_ SERVICE _ERROR_BARRED.

The HSS shall check if one or more serving nodes (not marked with the mobile not reachable flag) are registered for MT SMS; otherwise, the HSS shall return an Experimental-Result-Code set to DIAMETER_ERROR_ABSENT_USER and update the MWD list and MNRF/MNRG. If there is no serving node being registered for MT SMS and the Single-Attempt-Delivery flag in SRR-Flags AVP is set, the HSS shall not add the SC address into the MWD list.

The HSS shall then return a Send Routing Info for SM answer with a Result-Code set to DIAMETER_SUCCESSFUL that shall contain the addresses of the serving nodes that are registered for MT SMS according the following rules:

- if the GPRS indicator is not set, only one serving node address shall be returned according to the SM transfer option where MME is considered as a MSC. The address of the MME, if returned, shall comprise the MME Diameter address and the MME Number for MT SMS. The address of the SMSF, if returned, shall comprise the SMSF Diameter address and the SMSF Number.

- if the GPRS indicator is set, two serving node addresses may be returned of which

  - the Diameter address of the SGSN if available and the SGSN number,

  - either the number of the MSC or the Diameter address and the number of the MME for MT SMS.

- when two serving g nodes addresses are returned, the HSS selects which serving node it will populate in the Serving Node information element and in the Additional Serving Node information elements.

- if the feature SMSF-Support is commonly supported, the HSS includes addresses of the registered SMSFs (if any) in the response, regardless of the GPRS indicator.

  NOTE: MSC and MME cannot be both registered as serving nodes for MT SMS at a given time (cf 3GPP TS 23.272 [2])

If the stored MSISDN number is not the same as the one received in the Send Routing Info for SM request service, the stored MSISDN number shall be included in the message.

In the context of MSISDN-less SMS delivery in IMS (see 3GPP TS 23.204 [17]), if the HSS receives an SMSMI correlation ID, the HSS shall return the IP-SM-GW number and shall not forward the request to an IP-SM-GW.

5.2.1.4 Detailed behaviour of the SMS Router

When receiving a Send Routing Info for SM request, the SMS Router shall:

- send a Send Routing Info for SM request to the HSS to retrieve the routing information needed for routing the short message to the serving MSC or MME or SGSN or SMSF;

- if the Send Routing Info for SM answer received from HSS is successful, the SMS Router shall send a Send Routing Info for SM answer to the SMS-GMSC where

  - the SMS router shall populate the same Serving Node and Additional Serving Node fields (i.e AVPs) as the ones it received in the Send Routing Info for SM answer from HSS, but with its own SMS Router number and its own SMS Router Diameter address;

- if the Send Routing Info for SM answer received from HSS is not successful, the SMS Router shall send a Send Routing Info for SM answer to the SMS-GMSC with the same Diameter error result code.

If the SMS Router receives some of the following information elements, User Identifier Alert, MWD Status, MSC Absent User Diagnostic SM, MME Absent User Diagnostic SM, SGSN Absent User Diagnostic SM, it shall transfer them in the Send-Routing Info for SM answer to the SMS-GMSC.

5.2.2 Alert Service Centre procedure

5.2.2.1 General

This procedure shall be used between the HSS and the SMS-IWMSC to indicate that the MS is now recognized by the PLMN to have recovered its operation to allow for an MT SMS delivery. This procedure is used according to the call flows described in 3GPP TS 23.040 [2] clause 10.

Table 5.2.2.1-1 specifies the involved information elements for the request.

Table 5.2.2.1-2 specifies the involved information elements for the answer.

This procedure is mapped to the commands Alert-Service-Centre-Request/Answer (ALR/ALA) in the Diameter application specified in clause 5.3.2.

Table 5.2.2.1-1: Alert Service Centre Request

Information element name	Mapping to Diameter AVP	Cat.	Description
Service Centre Address	SC-Address	M	This information element shall contain the Service Centre address received from the mobile station.
User Identifier Alert	User-Identifier	M	This information element shall contain: - either the Alert MSISDN when it exists; - or the IMSI in the context of T4 device triggering (see 3GPP TS 23.682 [18] if MSISDN is not available; - or a dummy MSISDN value (see clause 3 of 3GPP TS 23.003 [16]) if no MSISDN in a retry context of SMS for IMS UE to IMS UE without MSISDN (see 3GPP TS 23.204 [17]).
SMSMI Correlation ID	SMSMI-Correlation-ID	C	This information shall contain the SIP-URI of the destination user which is stored in the Message Waiting Data list in a retry context of SMS for IMS UE to IMS UE without MSISDN (see 3GPP TS 23.204 [17]). The HSS-ID and the Originating SIP-URI shall be absent.
Maximum UE Availability Time	Maximum-UE-Availability-Time	C	This information element shall be included, if available. When present, it shall indicate the timestamp (in UTC) until which a UE using a power saving mechanism (such as extended idle mode DRX) is expected to be reachable for SM Delivery. This information may be used by the SMS Center to prioritize the retransmission of Short Message to UEs using a power saving mechanism.
Supported Features	Supported-Features (See 3GPP TS 29.229 [5])	O	If present, this information element shall contain the list of features supported by the origin host.

Table 5.2.2.1-2: Alert Service Centre Answer

Information element name	Mapping to Diameter AVP	Cat.	Description
Result	Result-Code / Experimental-Result	M	This information element shall contain the result of the request. The Result-Code AVP shall be used for errors defined in the Diameter base protocol see IETF RFC 6733 [20]). The Experimental-Result AVP shall be used for S6c errors. This is a grouped AVP which contains the 3GPP Vendor ID in the Vendor-Id AVP, and the error code in the Experimental-Result-Code AVP. This information element shall contain the result of the operation with an indication of the success / errors. No errors are defined for this case.
Supported Features	Supported-Features (See 3GPP TS 29.229 [5])	O	If present, this information element shall contain the list of features supported by the origin host.

5.2.2.2 Detailed behaviour of the HSS

The HSS shall make use of this procedure to alert the service centre when the mobile user is active after a short message transfer has failed because the mobile user is not reachable, or when the UE has indicated that it has memory capacity to accept a short message.

It is an operator option to resend an Alert Service Centre request to the SMS-IWMSC if the alert is unsuccessful. The number of repeat attempts and the interval between them is also an operator option. The service centre address should be purged from the MWD list if the alert is consistently unsuccessful.

5.2.2.3 Detailed behaviour of the SMS-IWMSC

When receiving an Alert Service Centre request the SMS-IWMSC shall check whether the service centre address is known. If the service centre address is not valid, then no further action shall be taken.

If the service centre address is valid, the SMS-IW-MSC generates an Alert Service Centre message towards the SMS Centre.

5.2.3 Report SM Delivery Status procedure

5.2.3.1 General

This procedure shall be used between the SMS-GMSC or the IP-SM-GW and the HSS to update the Message Waiting Data in the HSS or to inform the HSS of a successful SM transfer after polling. This procedure is invoked by the SMS-GMSC or the IP-SM-GW.

This procedure is applicable to an IP-SM-GW for its SMS Router function when using the S6c interface.

This procedure is used according to the call flows described in 3GPP TS 23.040 [2] clause 10.

Table 5.2.3.1-1 specifies the involved information elements for the request.

Table 5.2.3.1-2 specifies the involved information elements for the answer.

This procedure is mapped to the commands Report-SM-Delivery-Status-Request/Answer (RDR/RDA) in the Diameter application specified in clause 5.3.2.

Table 5.2.3.1-1: Report SM Delivery Status Request

Information element name	Mapping to Diameter AVP	Cat.	Description
User Identifier	User-Identifier	M	This information element shall contain: - the MSISDN of the user when it exists. - or the IMSI of the UE if MSISDN is not available in the context of a SM delivery status report following a T4 Submit Trigger (see 3GPP TS 23.682 [18] . - or the value of the HSS ID within the User-Name AVP in a retry context of SMS for IMS UE to IMS UE without MSISDN (see 3GPP TS 23.204 [17]),
SMSMI-Correlation ID	SMSMI-Correlation-ID	C	In a retry context of SMS for IMS UE to IMS UE without MSISDN (see 3GPP TS 23.204 [17]), this information element shall contain the SIP-URI of the (MSISDN-less) destination user. The originating SIP-URI and the HSS-ID shall be absent from this information element.
Service Centre Address	SC-Address	M	This information element shall contain the Service Centre address.
SM Delivery Outcome	SM-Delivery-Outcome	M	This information element shall contain the causes for setting the message waiting data in the HSS according to the network node(s) used for the SM delivery: - MSC - MME - SGSN - IP-SM-GW - SMSF-3GPP - SMSF-Non3GPP. At least one cause shall be present. A cause originated from a MSC and a cause originated from a MME shall not be both present. When the cause is Absent User, the Absent User Diagnostic, if available, shall be associated to the cause.
RDR Flags	RDR-Flags	O	This Information Element contains a bit mask. See 5.3.3.21 for the meaning of the bits and the condition for each bit to be set or not.
Supported Features	Supported-Features (See 3GPP TS 29.229 [5])	O	If present, this Information Element shall contain the list of features supported by the origin host.

Table 5.2.3.1-2: Report SM Delivery Status Answer

Information element name	Mapping to Diameter AVP	Cat.	Description
Result	Result-Code / Experimental-Result	M	This information element shall contain the Result of the request. The Result-Code AVP shall be used for errors defined in the Diameter base protocol (see IETF RFC 6733 [20]). The Experimental-Result AVP shall be used for S6c errors. This is a grouped AVP which contains the 3GPP Vendor ID in the Vendor-Id AVP, and the error code in the Experimental-Result-Code AVP. This information element shall contain the result of the operation with an indication of the success / errors. The following errors are applicable: - Unknown User; - Message Waiting List Full.
MSISDN-Alert	User-Identifier	C	This information element shall contain the Alert MSISDN of the user if it is different from the MSISDN received in the request.
Supported Features	Supported-Features (See 3GPP TS 29.229 [5])	O	If present, this information element shall contain the list of features supported by the origin host.

5.2.3.2 Detailed behaviour of the SMS-GMSC

The SMS-GMSC shall make use of this procedure if:

- the reason received from the serving node for failure to deliver the message is absent user, unidentified user or SM delivery failure with error cause "UE memory capacity exceeded", and the SC address is not yet included in the MWD set, and the serving node did not request the SMS-GMSC to retransmit the Short Message at a later requested retransmission time, or

- the reason received from the serving node for failure to deliver the message is absent user, unidentified user or SM delivery failure with error cause "UE memory capacity exceeded", and the corresponding flag in the HSS (as indicated in the information received from HSS) is not set, or

- the reason received from the serving node (MSC/MME, SGSN or SMSF) for failure to deliver the message is absent user and the absent user diagnostic is different from the absent user diagnostic received from the HSS.

If absent user diagnostic information (see 3GPP TS 23.040 [3]) is received with the absent user error indication then the SMS-GMSC shall relay this information to the HSS.

5.2.3.3 Detailed behaviour of IP-SM-GW

The IP-SM-GW shall make use of this procedure if:

- the reason for failure to deliver the message is absent user, unidentified user or SM delivery failure with error cause "UE memory capacity exceeded", and the SC address is not yet included in the MWD set, or

- the reason for failure to deliver the message is absent user, unidentified user or SM delivery failure with error cause "UE memory capacity exceeded", and the corresponding flag in the HSS (as indicated in the information received in the MAP_INFORM_SERVICE_CENTRE) is not set, or

- the reason for failure to deliver the message is absent user and the absent user diagnostic is different from the absent user diagnostic received from the HSS.

5.2.3.4 Detailed behaviour of the HSS

When receiving a Report SM Delivery Status request the HSS shall check if the user is known.

If the user is not known, the HSS shall return an Experimental-Result-Code set to DIAMETER_ERROR_USER_UNKNOWN.

If it is known, the HSS shall update the Message Waiting data as described in 3GPP TS 23.040 [3]. If the Single-Attempt-Delivery flag in RDR-Flags AVP is set, the HSS shall not add the SC address into the MWD list.

If the message waiting data is full, the HSS shall return an Experimental-Result-Code set to DIAMETER_ERROR_MWD_LIST_FULL.

If the received MSISDN is different from the stored MSISDN, the HSS shall return the Alert MSISDN.

5.3 Protocol specification

5.3.1 Routing considerations

5.3.1.1 Requests from the SMS-GMSC or the SMS router

5.3.1.1.1 Introduction

The clauses in 5.3.1.1 specify the use of the Diameter routing AVPs Destination-Realm and Destination-Host over the S6c interface for Diameter command requests from the SMS-GMSC or the SMS router or the IP-SM-GW (i.e. for the Send Routing Info for SM and the Report SM Delivery Status procedures) The clause 5.3.1.1 also applies for the Report SM Delivery Status request generated by a SMS-SC in a retry context of SMS for IMS UE to IMS UE without MSISDN (see 3GPP TS 23.204 [17]) .

5.3.1.1.2 Routing from the originating PLMN

If the SMS-GMSC or the SMS router has stored or can obtain the address/name and the home network domain name of the HSS identified by the MSISDN or the IMSI, both the Destination-Realm and Destination-Host AVPs shall be present in the request.

The SMS Router shall use the MCC/MNC values of the PLMN to which it belongs, to build the MCC/MNC based network domain as described in clause 19.2 of 3GPP TS 23.003 [16] and include it in the Destination-Realm AVP of the request. The request shall then be routed to the next Diameter node.

If the SMS-GMSC can only obtain the MCC/MNC values from the MSISDN or the IMSI, the SMS-GMSC shall use them to build the MCC/MNC based network domain as described in clause 19.2 of 3GPP TS 23.003 [16] and include it in the Destination-Realm AVP of the request. The request shall then be routed to the next Diameter node.

If the SMS-GMSC cannot obtain the MCC/MNC values from the MSISDN of the user, the SMS-GMSC may forward the request to a Diameter node within the same PLMN, the Destination Realm content being left to the PLMN operator choice. Then:

- if a Diameter node in the routing path insides the PLMN of the SMS-GSMC can obtain the MCC/MNC values of the PLMN to which the user is subscribed to (i.e. when the number portability is resolved in the network of the SMS-GMSC), or

- if, otherwise, the Diameter node can obtain the MCC/MNC values of the PLMN associated to the CC and NDC codes of the MSISDN of the user, then

- the Diameter node shall use them to build the MCC/MNC based network domain as described in clause 19.2 of 3GPP TS 23.003 [16] and include it in the Destination-Realm AVP of the request. The request shall then be routed to the next Diameter node.

If the MCC/MNC values of the PLMN associated to the CC and NDC codes of the MSISDN or the MCC/MNC values of the PLMN to which the user is subscribed to cannot be obtained in the PLMN of the SMS-GMSC, the request shall be replaced in the PLMN of the SMS-GMSC by an equivalent request routed through a MAP interface (e.g. via an IWF).

NOTE 1: The inter PLMN routing principle is to reuse the routing based on a MCC/MNC based domain name as used by other Diameter applications such as S6a/d. It is assumed that obtaining the relevant MCC/MNC values from the MSISDN can be achieved in the PLMN to which the SMS-GMSC belongs. Otherwise MAP based routing is used. This routing principle may be completed with other routing solutions in the future.

NOTE 2: The Number portability resolution in the PLMN of the SMS-GMSC can be handled by an intermediate Diameter agent consulting a Number Portability Database of the Network Portability domain to which the PLMN of the SMS-GMSC belongs.

If the SMS-SC or the SMS-GMSC, in a retry context of SMS for IMS UE to IMS UE without MSISDN (see 3GPP TS 23.204 [17]), has stored or can obtain the address/name and the home network domain name of the HSS identified by the HSS ID, both the Destination-Realm and Destination-Host AVPs shall be present in the request.

If the SMS-SC or the SMS-GMSC, in a retry context of SMS for IMS UE to IMS UE without MSISDN (see 3GPP TS 23.204 [17]), can only obtain the MCC/MNC values from the HSS ID, the SMS-SC shall use them to build the MCC/MNC based network domain as described in clause 19.2 of 3GPP TS 23.003 [16] and include it in the Destination-Realm AVP of the request. The request shall then be routed to the next Diameter node.

NOTE: In a retry context of MSISDN-less SMS delivery in IMS (see 3GPP TS 23.204 [17]), the SMS-SC gets the HSS-ID from the MO Forward Short Message request as described in clause 6.2.1.

5.3.1.1.3 Routing in the HPLMN

When the request reaches a Diameter node in the home PLMN of the user and when multiple and separately addressable HSSs have been deployed in the home PLMN, the identity of the HSS that holds the subscriber data for a given user identified by its MSISDN may be retrieved by a user identity to HSS resolution mechanism as described in clause 5.4.

When the request (i.e Send Routing Info for SM or Report SM Delivery Status) for SM occurs in the retry context of SMS for IMS UE to IMS UE without MSISDN (see 3GPP TS 23.204 [17]), the Diameter identity of the HSS that holds

the subscriber data for a given user may be retrieved by a user identity to HSS resolution mechanism as described in clause 5.4, where the HSS ID conveyed in the request is considered as a user identity.

Consequently, the Destination-Host AVP is declared as optional in the ABNF for all requests initiated by an SMS-GMSC or a SMS Router.

The HSS, when receiving a Send Routing Info for SM request, checks if an SMS Router is configured in the home network or if an IP-SM-GW has been registered for the user. If yes, the HSS shall act as a Diameter proxy and forward the request to the SMS Router or to the IP-SM-GW, by inserting the Diameter address of the SMS Router or of the IP-SM-GW as the Diameter destination address. If the Send Routing Info for SM request occurs in the retry context of SMS for IMS UE to IMS UE without MSISDN (see 3GPP TS 23.204 [17]), the HSS shall return the IP-SM-GW address and shall not forward the request to an IP-SM-GW.

If the Vendor-Specific-Application-ID AVP is received in any of the commands defined in this specification, it shall be ignored by the receiving node, and it shall not be used for routing purposes.

5.3.1.2 Requests from the HSS

This clause specifies the use of the Diameter routing AVPs Destination-Realm and Destination-Host over the S6c interface for Diameter command requests from the HSS (i.e. for the Alert SC procedure).

If the HSS has stored the address/name of the SMS-SC and the associated home network domain name in the Message Waiting Data of the user, both the Destination-Realm and Destination-Host AVPs shall be present in the Diameter request. Otherwise the routing shall use MAP.

5.3.2 Commands

5.3.2.1 Introduction

This clause defines the Command code values and related ABNF for each command described for the S6c interface.

5.3.2.2 Command-Code values

This clause defines the Command-Code values for the S6c interface application as allocated by IANA in the IETF RFC 5516 [8].

Every command is defined by means of the ABNF syntax IETF RFC 2234 [6], according to the Command Code Format (CCF) specification defined in IETF RFC 6733 [20]. In the case, the definition and use of an AVP is not specified in this document, the guidelines in IETF RFC 6733 [20] shall apply.

The Vendor-Specific-Application-Id AVP shall not be included in any command sent by Diameter nodes supporting applications defined in this specification. If the Vendor-Specific-Application-Id AVP is received in any of the commands defined in this specification, it shall be ignored by the receiving node.

NOTE: The Vendor-Specific-Application-Id is included as an optional AVP in all Command Code Format specifications defined in this specification in order to overcome potential interoperability issues with intermediate Diameter agents non-compliant with IETF RFC 6733 [20].

The following Command Codes are defined in this specification:

Table 5.3.2.2/1: Command-Code values for S6c

Command-Name	Abbreviation	Code	Clause
Send-Routing-Info-for-SM-Request	SRR	8388647	5.3.2.3
Send-Routing-Info-for-SM-Answer	SRA	8388647	5.3.2.4
Alert-Service-Centre-Request	ALR	8388648	5.3.2.5
Alert-Service-Centre-Answer	ALA	8388648	5.3.2.6
Report-SM-Delivery-Status-Request	RDR	8388649	5.3.2.7
Report-SM-Delivery-Status-Answer	RDA	8388649	5.3.2.8

For these commands, the Application-ID field shall be set to 16777312 (application identifier of the S6c interface application allocated by IANA).

5.3.2.3 Send-Routing-Info-for-SM-Request (SRR) Command

The Send-Routing-Info-for-SM-Request (SRR) command, indicated by the Command-Code field set to 8388647 and the "R" bit set in the Command Flags field, is sent from SMS-GMSC to HSS or SMS Router or from SMS Router to HSS.

Message Format:

```
< Send-Routing-Info-for-SM-Request > ::=    < Diameter Header: 8388647, REQ, PXY, 16777312 >
                              < Session-Id >
                              [ DRMP ]
                              [ Vendor-Specific-Application-Id ]
                              { Auth-Session-State }
                              { Origin-Host }
                              { Origin-Realm }
                              [ Destination-Host ]
                              { Destination-Realm }
                              [ MSISDN ]
                              [ User-Name ]
                              [ SMSMI-Correlation-ID ]
                              *[ Supported-Features ]
                              [ SC-Address ]
                              [ SM-RP-MTI ]
                              [ SM-RP-SMEA ]
                              [ SRR-Flags ]
                              [ SM-Delivery-Not-Intended ]
                              *[ AVP ]
                              *[ Proxy-Info ]
                              *[ Route-Record ]
```

5.3.2.4 Send-Routing-info-for-SM-Answer (SRA) Command

The Send-Routing-Info-for-SM-Answer command (SRA) command, indicated by the Command-Code field set to 8388647 and the 'R' bit cleared in the Command Flags field, is sent from HSS to SMS-GMSC or SMS Router or from SMS Router to SMS-GMSC.

Message Format

```
< Send-Routing-info-for-SM-Answer > ::=    < Diameter Header: 8388647, PXY, 16777312 >
                              < Session-Id >
                              [ DRMP ]
                              [ Vendor-Specific-Application-Id ]
                              [ Result-Code ]
                              [ Experimental-Result ]
                              { Auth-Session-State }
                              { Origin-Host }
                              { Origin-Realm }
                              [ User-Name ]
                              *[ Supported-Features ]
                              [ Serving-Node ]
                              [ Additional-Serving-Node ]
                              [ SMSF-3GPP-Address ]
                              [ SMSF-Non-3GPP-Address ]
                              [ LMSI ]
                              [ User-Identifier ]
                              [ MWD-Status ]
                              [ MME-Absent-User-Diagnostic-SM ]
                              [ MSC-Absent-User-Diagnostic-SM ]
                              [ SGSN-Absent-User-Diagnostic-SM ]
                              [ SMSF-3GPP-Absent-User-Diagnostic-SM ]
                              [ SMSF-Non-3GPP-Absent-User-Diagnostic-SM ]
                              *[ AVP ]
```

                                                        [Failed-AVP]
                                                        *[Proxy-Info]
                                                        *[Route-Record]

5.3.2.5   Alert-Service-Centre-Request (ALR) Command

The Alert-Service-Centre-Request (ALR) command, indicated by the Command-Code field set to 8388648 and the "R" bit set in the Command Flags field, is sent from the HSS to the SMS-IWMSC and from the MME or SGSN to the SMS-GMSC (possibly via an SMS Router).

Message Format:

            < Alert-Service-Centre-Request > ::=   < Diameter Header: 8388648, REQ, PXY, 16777312 >
                                                    < Session-Id >
                                                    [DRMP]
                                                    [Vendor-Specific-Application-Id]
                                                    { Auth-Session-State }
                                                    { Origin-Host }
                                                    { Origin-Realm }
                                                    [Destination-Host]
                                                    { Destination-Realm }
                                                    { SC-Address }
                                                    { User-Identifier }
                                                    [SMSMI-Correlation-ID]
                                                    [Maximum-UE-Availability-Time]
                                                    [SMS-GMSC-Alert-Event]
                                                    [Serving-Node]
                                                    *[Supported-Features]
                                                    *[AVP]
                                                    *[Proxy-Info]
                                                    *[Route-Record]

5.3.2.6   Alert-Service-Centre-Answer (ALA) Command

The Alert-Service-Centre-Answer (ALA) command, indicated by the Command-Code field set to 8388648 and the 'R' bit cleared in the Command Flags field, is sent from the SMS-IWMSC to the HSS and from the SMS-GMSC to the MME or SGSN (possibly via an SMS Router).

Message Format

            < Alert-Service-Centre-Answer > ::=   < Diameter Header: 8388648, PXY, 16777312 >
                                                    < Session-Id >
                                                    [DRMP]
                                                    [Vendor-Specific-Application-Id]
                                                    [Result-Code]
                                                    [Experimental-Result]
                                                    { Auth-Session-State }
                                                    { Origin-Host }
                                                    { Origin-Realm }
                                                    *[Supported-Features]
                                                    *[AVP]
                                                    [Failed-AVP]
                                                    *[Proxy-Info]
                                                    *[Route-Record]

5.3.2.7   Report-SM-Delivery-Status-Request (RDR) Command

The Report-SM-Delivery-Status-Request (RDR) command, indicated by the Command-Code field set to 8388649 and the "R" bit set in the Command Flags field, is sent from SMS-GMSC or IP-SM-GW to HSS.

Message Format:

```
< Report-SM-Delivery-Status-Request > ::=   < Diameter Header: 8388649, REQ, PXY, 16777312 >
                                    < Session-Id >
                                    [ DRMP ]
                                    [ Vendor-Specific-Application-Id ]
                                    { Auth-Session-State }
                                    { Origin-Host }
                                    { Origin-Realm }
                                    [ Destination-Host ]
                                    { Destination-Realm }
                                    *[ Supported-Features ]
                                    { User-Identifier }
                                    [ SMSMI-Correlation-ID ]
                                    { SC-Address }
                                    { SM-Delivery-Outcome }
                                    [ RDR-Flags ]
                                    *[ AVP ]
                                    *[ Proxy-Info ]
                                    *[ Route-Record ]
```

5.3.2.8 Report-SM-Delivery-Status-Answer (RDA) Command

The Report-SM-Delivery-Status-Answer (RDA) command, indicated by the Command-Code field set to 8388649 and the 'R' bit cleared in the Command Flags field, is sent from HSS to SMS-GMSC or IP-SM-GW.

Message Format

```
< Report-SM-Delivery-Status-Answer > ::=   < Diameter Header: 8388649, PXY, 16777312 >
                                    < Session-Id >
                                    [ DRMP ]
                                    [ Vendor-Specific-Application-Id ]
                                    [ Result-Code ]
                                    [ Experimental-Result ]
                                    { Auth-Session-State }
                                    { Origin-Host }
                                    { Origin-Realm }
                                    *[ Supported-Features ]
                                    [ User-Identifier ]
                                    *[ AVP ]
                                    [ Failed-AVP ]
                                    *[ Proxy-Info ]
                                    *[ Route-Record ]
```

5.3.3 AVPs

5.3.3.1 General

The following table specifies the Diameter AVPs defined for the S6c interface protocol, their AVP Code values, types, possible flag values and whether or not the AVP may be encrypted. The Vendor-ID header of all AVPs defined in this specification shall be set to 3GPP (10415).

For all AVPs which contain bit masks and are of the type Unsigned32, e.g. TFR-Flags, bit 0 shall be the least significant bit. For example, to get the value of bit 0, a bit mask of 0x0001 should be used.

Table 5.3.3.1/1: S6c specific Diameter AVPs

Attribute Name	AVP Code	Clause defined	Value Type	AVP Flag rules				May Encr.
				Must	May	Should not	Must not	
SM-RP-MTI	3308	5.3.3.2	Enumerated	M, V				No
SM-RP-SMEA	3309	5.3.3.3	OctetString	M, V				No
SRR-Flags	3310	5.3.3.4	Unsigned32	M, V				No
SM-Delivery-Not-Intended	3311	5.3.3.5	Enumerated	M, V				No
MWD-Status	3312	5.3.3.8	Unsigned32	M, V				No
MME-Absent-User-Diagnostic-SM	3313	5.3.3.9	Unsigned32	M, V				No
MSC-Absent-User-Diagnostic-SM	3314	5.3.3.10	Unsigned32	M, V				No
SGSN-Absent-User-Diagnostic SM	3315	5.3.3.11	Unsigned32	M, V				No
SM-Delivery-Outcome	3316	5.3.3.14	Grouped	M, V				No
MME-SM-Delivery-Outcome	3317	5.3.3.15	Grouped	M, V				No
MSC-SM-Delivery-Outcome	3318	5.3.3.16	Grouped	M, V				No
SGSN-SM-Delivery-Outcome	3319	5.3.3.17	Grouped	M, V				No
IP-SM-GW-SM-Delivery-Outcome	3320	5.3.3.18	Grouped	M, V				No
SM-Delivery-Cause	3321	5.3.3.19	Enumerated	M, V				No
Absent-User-Diagnostic-SM	3322	5.3.3.20	Unsigned32	M, V				No
RDR-Flags	3323	5.3.3.21	Unsigned32	V			M	No
Maximum-UE-Availability-Time	3329	5.3.3.22	Time	V			M	No
SMS-GMSC-Alert-Event	3333	5.3.3.23	Unsigned32	V			M	No
SMSF-3GPP-Absent-User-Diagnostic-SM	3334	5.3.3.25	Unsigned32	V			M	No
SMSF-Non-3GPP-Absent-User-Diagnostic-SM	3335	5.3.3.26	Unsigned32	V			M	No
SMSF-3GPP-SM-Delivery-Outcome	3336	5.3.3.27	Grouped	V			M	No
SMSF-Non-3GPP-SM-Delivery-Outcome	3337	5.3.3.28	Grouped	V			M	No
SMSF-3GPP-Number	3338	5.3.3.29	OctetString	V			M	No
SMSF-Non-3GPP-Number	3339	5.3.3.30	OctetString	V			M	No
SMSF-3GPP-Name	3340	5.3.3.31	DiameterIdentity	V			M	No
SMSF-Non-3GPP-Name	3341	5.3.3.32	DiameterIdentity	V			M	No
SMSF-3GPP-Realm	3342	5.3.3.33	DiameterIdentity	V			M	No
SMSF-Non-3GPP-Realm	3343	5.3.3.34	DiameterIdentity	V			M	No
SMSF-3GPP-Address	3344	5.3.3.35	Grouped	V			M	No
SMSF-Non-3GPP-Address	3345	5.3.3.36	Grouped	V			M	No
NOTE 1: The AVP header bit denoted as "M", indicates whether support of the AVP is required. The AVP header bit denoted as "V" indicates whether the optional Vendor-ID field is present in the AVP header. For further details, see IETF RFC 6733 [20].								
NOTE 2: If the M-bit is set for an AVP and the receiver does not understand the AVP, it shall return a rejection. If the M-bit is not set for an AVP, the receiver shall not return a rejection, whether or not it understands the AVP. If the receiver understands the AVP but the M-bit value does not match with the definition in this table, the receiver shall ignore the M-bit.								

The following table specifies the Diameter AVPs re-used from existing Diameter Applications, including a reference to their respective specifications and when needed, a short description of their use within this interface.

Any other AVPs from existing Diameter Applications, except for the AVPs from Diameter Base Protocol specified in IETF RFC 6733 [20], do not need to be supported. The AVPs from Diameter base protocol specified in IETF RFC 6733 [20] are not included in table 5.3.3.1/2, but they may be re-used for this interface.

Table 5.3.3.1/2: S6c re-used Diameter AVPs

Attribute Name	Reference	Comments	M-bit
User-Name	IETF RFC 6733 [20]		Must
MSISDN	3GPP TS 23.329 [14]		
SC-Address	3GPP TS 29.338	It is defined for the SGd/Gdd interface, see clause 6.3.3.2	
LMSI	3GPP TS 29.173 [10]		
Serving-Node	3GPP TS 29.173 [10]	See clause 5.3.3.6	
MSC-Number	3GPP TS 29.173 [10]		
MME-Name	3GPP TS 29.173 [10]		
MME-Realm	3GPP TS 29.173 [10]		Must
MME-Number-for-MT-SMS	3GPP TS 29.272 [4]		Must
SGSN-Number	3GPP TS 29.272 [4]		
SGSN-Name	3GPP TS 29.173 [10]		
SGSN-Realm	3GPP TS 29.173[10]		
Additional-Serving-Node	3GPP TS 29.173 [10]	See clause 5.3.3.7	
User-Identifier	3GPP TS 29.336 [15]		
SM-Delivery-Failure-Cause	3GPP TS 29.338	It is defined for the SGd/Gdd interface, see clause 6.3.3.5	
IP-SM-GW-Name	3GPP TS 29.336 [15]		
IP-SM-GW-Number	3GPP TS 29.336 [15]		
SMSMI-Correlation-ID	3GPP TS 29.338	It is defined for the SGd/Gdd interface, see clause 6.3.3.2	
Destination-SIP-URI	3GPP TS 29.338	It is defined for the SGd/Gdd interface, see clause 6.3.3.2	
Supported-Features	3GPP TS 29.229 [5]		
Feature-List-ID	3GPP TS 29.229 [5]	See clause 5.3.3.12	
Feature-List	3GPP TS 29.229 [5]	See clause 5.3.3.13	
DRMP	IETF RFC 7944 [19]	see clause 5.3.3.24	Must not set
NOTE 1: The M-bit settings for re-used AVPs override those of the defining specifications that are referenced. Values include: "Must set", "Must not set". If the M-bit setting is blank, then the defining specification applies.			
NOTE 2: If the M-bit is set for an AVP and the receiver does not understand the AVP, it shall return a rejection. If the M-bit is not set for an AVP, the receiver shall not return a rejection, whether or not it understands the AVP. If the receiver understands the AVP but the M-bit value does not match with the definition in this table, the receiver shall ignore the M-bit.			

5.3.3.2   SM-RP-MTI

The SM-RP-MTI AVP is of type Enumerated and shall contain the RP-Message Type Indicator of the Short Message. The following values are defined:

- SM_DELIVER (0)

- SM_STATUS_REPORT (1)

5.3.3.3   SM-RP-SMEA

The SM-RP-SMEA AVP is of type OctetString and shall contain the RP-Originating SME-address of the Short Message Entity that has originated the SM. It shall be formatted according to the formatting rules of the address fields described in 3GPP TS 23.040 [3].

5.3.3.4 SRR-Flags

The SRR-Flags AVP is of type Unsigned32 and it shall contain a bit mask. The meaning of the bits shall be as defined in table 5.3.3.4./1:

Table 5.3.3.4/1: SRR-Flags

Bit	Name	Description
0	GPRS-Indicator	This bit shall be set if the SMS-GMSC supports receiving of two serving nodes addresses from the HSS.
1	SM-RP-PRI	This bit shall be set if the delivery of the short message shall be attempted when a service centre address is already contained in the Message Waiting Data file
2	Single-Attempt-Delivery	This bit if set indicates that only one delivery attempt shall be performed for this particular SM.
NOTE 1: Bits not defined in this table shall be cleared by the sending entity and discarded by the receiving entity.		

5.3.3.5 SM-Delivery-Not-Intended

The SM-Delivery-Not-Intended AVP is of type Enumerated and shall indicate by its presence that delivery of a short message is not intended. It further indicates whether only IMSI or only MCC+MNC with the following values:

- ONLY_IMSI_REQUESTED (0),

- ONLY_MCC_MNC_REQUESTED (1).

5.3.3.6 Serving-Node

The Serving-Node AVP is of type Grouped. This AVP shall contain the information about the network node serving the targeted SMS user. It is originally defined in 3GPP TS 29.173 [10].

AVP format

> Serving-Node ::=<AVP header: 2401 10415>
>
> > [SGSN-Name]
> >
> > [SGSN-Realm]
> >
> > [SGSN-Number]
> >
> > [MME-Name]
> >
> > [MME-Realm]
> >
> > [MME-Number-for-MT-SMS]
> >
> > [MSC-Number]
> >
> > [IP-SM-GW-Number]
> >
> > [IP-SM-GW-Name]
> >
> > [IP-SM-GW-Realm]
> >
> > *[AVP]

The following combinations are allowed:

a) SGSN-Number

b) SGSN-Name & SGSN-Realm & SGSN-Number if the HSS supports the "Gdd in SGSN" feature and has received the "Gdd in SGSN" indication over S6a or Gr interface from the SGSN (cf. 3GPP TS 29.272 [4] and 3GPP TS 29.002 [9])

c) MME-Name & MME-Realm & MME-Number-for-MT-SMS

d) MSC-Number

e) MSC-Number & MME-Name & MME-Realm

f) IP-SM-GW-Number

g) IP-SM-GW-Number & IP-SM-GW-Name.

5.3.3.7 Additional-Serving-Node

The Additional-Serving-Node AVP is of type Grouped. This AVP shall contain the information about the network node serving the targeted user. It is originally defined in 3GPP TS 29.173 [10].

AVP format

> Additional-Serving-Node ::=   <AVP header: 2406 10415>
>
>> [SGSN-Name]
>>
>> [SGSN-Realm]
>>
>> [SGSN-Number]
>>
>> [MME-Name]
>>
>> [MME-Realm]
>>
>> [MME-Number-for-MT-SMS]
>>
>> [MSC-Number]
>>
>> *[AVP]

The following combinations are allowed:

a) SGSN-Number

b) SGSN-Name & SGSN-Realm & SGSN-Number if the HSS supports the "Gdd in SGSN" feature and has received the "Gdd in SGSN" indication over S6a or Gr interface from the SGSN (cf. 3GPP TS 29.272 [4] and 3GPP TS 29.002 [9]

c) MME-Name & MME-Realm & MME-Number-for-MT-SMS

d) MSC-Number

e) MSC-Number & MME-Name & MME-Realm

5.3.3.8 MWD-Status

The MWD-Status AVP is of type Unsigned32 and it shall contain a bit mask. The meaning of the bits shall be as defined in table 5.3.3.8/1:

Table 5.3.3.8/1: MWD Status

bit	name	Description
0	SC-Address Not included	This bit when set shall indicate that the SC Address has not been added to the Message Waiting Data in the HSS.
1	MNRF-Set	This bit, when set, shall indicate that the MNRF flag is set in the HSS
2	MCEF-Set	This bit, when set, shall indicate that the MCEF flag is set in the HSS.
3	MNRG-Set	This bit, when set, shall indicate that the MNRG flag is set in the HSS
4	MNR5G-Set	This bit, when set, shall indicate that the HSS/UDM is waiting for a reachability notification / registration from 5G serving nodes.
NOTE:		Bits not defined in this table shall be cleared by the sending HSS and discarded by the receiving MME.

5.3.3.9 MME-Absent-User-Diagnostic-SM

The MME-Absent-User-Diagnostic-SM AVP is of type Unsigned32 and shall indicate the diagnostic explaining the absence of the user given by the MME. The values are defined in 3GPP TS 23.040 [3] clause 3.3.2.

5.3.3.10 MSC-Absent-User-Diagnostic-SM

The MSC-Absent-User-Diagnostic-SM AVP is of type Unsigned32 and shall indicate the diagnostic explaining the absence of the user given by the MSC. The values are defined in 3GPP TS 23.040 [3] clause 3.3.2.

5.3.3.11 SGSN-Absent-Subscriber-Diagnostic-SM

The SGSN-Absent-User-Diagnostic-SM AVP is of type Unsigned32 and shall indicate the diagnostic explaining the absence of the user given by the SGSN. The values are defined in 3GPP TS 23.040 [3] clause 3.3.2.

5.3.3.12 Feature-List-ID AVP

The syntax of this AVP is defined in 3GPP TS 29.229 [5]. For this release, the Feature-List-ID AVP value shall be set to 1.

5.3.3.13 Feature-List AVP

The syntax of this AVP is defined in 3GPP TS 29.229 [5]. A null value indicates that there is no feature used by the application.

For the S6c application, the meaning of the bits shall be as defined in table 5.3.3.13/1 for the Feature-List-ID 1.

Table 5.3.3.13/1: Features of Feature-List-ID 1 used in S6c

Feature bit	Feature	M/O	Description
0	SMSF-Support	O	SMSF-Support This feature is applicable for the SRR/SRA command pair. If the SMS-GMSC or IP-SM-GW or SMS-Router does not support this feature, the HSS shall not return SMSF related AVPs (SMSF-3GPP-Address, SMSF-Non-3GPP-Address, SMSF-3GPP-Absent-User-Diagnostic-SM, SMSF-Non-3GPP-Absent-User-Diagnostic-SM) in SRA, and when the UE is known not to be reachable for SMS via MSC/MME and/or SGSN, the HSS may populate AVPs within the Serving-Node AVP and within the Additional-Serving-Node AVP with available SMSF address information.
Feature bit: The order number of the bit within the Supported-Features AVP, e.g. "1".			
Feature: A short name that can be used to refer to the bit and to the feature, e.g. "SMSF-Support".			
M/O: Defines if the implementation of the feature is mandatory ("M") or optional ("O").			
Description: A clear textual description of the feature.			

5.3.3.14   SM-Delivery-Outcome

The SM-Delivery-Outcome AVP is of type Grouped. This AVP contains the result of the SM delivery.

AVP format:

> SM-Delivery-Outcome::= <AVP header: 3316 10415>
>
>> [MME-SM-Delivery-Outcome]
>>
>> [MSC-SM-Delivery-Outcome]
>>
>> [SGSN-SM-Delivery-Outcome]
>>
>> [IP-SM-GW-SM-Delivery-Outcome]
>>
>> [SMSF-3GPP-SM-Delivery-Outcome]
>>
>> [SMSF-Non-3GPP-SM-Delivery-Outcome]
>>
>> *[AVP]

5.3.3.15   MME-SM-Delivery-Outcome

The MME-Delivery-Outcome AVP is of type grouped and shall indicate the outcome of the SM delivery for setting the message waiting data in the HSS when the SM delivery is with an MME.

AVP format:

> MME-SM-Delivery-Outcome::= <AVP header: 3317 10415>>
>
>> [SM-Delivery-Cause]
>>
>> [Absent-User-Diagnostic-SM]

5.3.3.16   MSC-SM-Delivery-Outcome

The MSC-Delivery-Outcome AVP is of type grouped and shall indicate the outcome of the SM delivery for setting the message waiting data in the HSS when the SM delivery is with an MSC.

AVP format:

> MSC-SM-Delivery-Outcome::= <AVP header: 3318 10415>
>
>> [SM-Delivery-Cause]
>>
>> [Absent-User-Diagnostic-SM]

5.3.3.17   SGSN-SM-Delivery-Outcome

The SGSN-Delivery-Outcome AVP is of type grouped and shall indicate the outcome of the SM delivery for setting the message waiting data in the HSS when the SM delivery is with an SGSN.

AVP format:

> SGSN-SM-Delivery-Outcome::= <AVP header: 3319 10415>
>
>> [SM-Delivery-Cause]
>>
>> [Absent-User-Diagnostic-SM]

5.3.3.18   IP-SM-GW-SM-Delivery-Outcome

The IP-SM-GW-SM-Delivery-Outcome AVP is of type grouped and shall indicate the outcome of the SM delivery for setting the message waiting data when the SM delivery is with an IP-SM-GW. The following values are defined.

AVP format:

> IP-SM-GW-SM-Delivery-Outcome::= <AVP header: 3320 10415>

>> [SM-Delivery-Cause]

>> [Absent-User-Diagnostic-SM]

5.3.3.19   SM-Delivery-Cause

The SM-Delivery-Cause AVP is of type Enumerated and shall indicate the cause of the SMP delivery result. The following values are defined:

- UE_ MEMORY_CAPACITY_EXCEEDED (0)

- ABSENT_USER (1)

- SUCCESSFUL_TRANSFER (2)

5.3.3.20   Absent-User-Diagnostic-SM

The Absent-User-Diagnostic-SM AVP is of type Unsigned32 and shall indicate the diagnostic explaining the absence of the subscriber. The values are defined in 3GPP TS 23.040 [3] clause 3.3.2.

5.3.3.21   RDR-Flags

The RDR-Flags AVP is of type Unsigned32 and it shall contain a bit mask. The meaning of the bits shall be as defined in table 5.3.3.21/1:

Table 5.3.3.21/1: RDR-Flags

Bit	Name	Description
0	Single-Attempt-Delivery	This bit if set indicates that only one delivery attempt shall be performed for this particular SM.
NOTE 1: Bits not defined in this table shall be cleared by the sending entity and discarded by the receiving entity.		

5.3.3.22   Maximum-UE-Availability-Time

The Maximum-UE-Availability-Time is of type Time and in shall contain the timestamp (in UTC) until which a UE using a power saving mechanism (such as extended idle mode DRX) is expected to be reachable for SM Delivery.

5.3.3.23   SMS-GMSC-Alert-Event

The SMS-GMSC-Alert-Event AVP is of type Unsigned32 and it shall contain a bit mask. The meaning of the bits shall be as defined in table 5.3.3.23/1:

Table 5.3.3.23/1: SMS-GMSC-Alert-Event

Bit	Name	Description
0	UE-Available-For-MT-SMS	This bit, when set, shall indicate that the UE is now available for MT SMS
1	UE-Under-New-Serving-Node	This bit, when set, shall indicate that the UE has moved under the coverage of another MME or SGSN.
NOTE 1: Bits not defined in this table shall be cleared by the sending entity and discarded by the receiving entity.		

5.3.3.24   DRMP

The DRMP AVP is of type Enumerated and it is defined in IETF RFC 7944 [19]. This AVP allows the HSS, the SMS-GMSC, the SMS-Router and the IP-SM-GW to indicate the relative priority of Diameter messages over the S6c interface. The DRMP AVP may be used to set the DSCP marking for transport of the associated Diameter message.

5.3.3.25   SMSF-3GPP-Absent-User-Diagnostic-SM

The SMSF-3GPP-Absent-User-Diagnostic-SM AVP is of type Unsigned32 and shall indicate the diagnostic explaining the absence of the user given by the SMSF registered for 3GPP access. The values are defined in 3GPP TS 23.040 [3] clause 3.3.2.

5.3.3.26   SMSF-Non-3GPP-Absent-User-Diagnostic-SM

The SMSF-Non-3GPP-Absent-User-Diagnostic-SM AVP is of type Unsigned32 and shall indicate the diagnostic explaining the absence of the user given by the SMSF registered for Non-3GPP access. The values are defined in 3GPP TS 23.040 [3] clause 3.3.2.

5.3.3.27   SMSF-3GPP-SM-Delivery-Outcome

The SMSF-3GPP-SM-Delivery-Outcome AVP is of type grouped and shall indicate the outcome of the SM delivery for setting the message waiting data in the HSS when the SM delivery is with an SMSF registered for 3GPP access.

AVP format:

> SMSF-3GPP-SM-Delivery-Outcome::= <AVP header: 3336 10415>>
>
>> [SM-Delivery-Cause]
>
>> [Absent-User-Diagnostic-SM]

5.3.3.28   SMSF-Non-3GPP-SM-Delivery-Outcome

The SMSF-Non-3GPP-SM-Delivery-Outcome AVP is of type grouped and shall indicate the outcome of the SM delivery for setting the message waiting data in the HSS when the SM delivery is with an SMSF registered for Non-3GPP access.

AVP format:

> SMSF-Non-3GPP-SM-Delivery-Outcome::= <AVP header: 3337 10415>>
>
>> [SM-Delivery-Cause]
>
>> [Absent-User-Diagnostic-SM]

5.3.3.29   SMSF-3GPP-Number

The SMSF-3GPP-Number AVP is of type OctetString and it shall contain the ISDN number of the SMSF registered for 3GPP access. For further details on the definition of this AVP, see 3GPP TS 23.003 [3]. This AVP contains an SMSF-3GPP-Number in international number format as described in ITU-T Rec E.164 [13] and shall be encoded as a TBCD-string. See 3GPP TS 29.002 [9] for encoding of TBCD-strings. This AVP shall not include leading indicators for the nature of address and the numbering plan; it shall contain only the TBCD-encoded digits of the address.

5.3.3.30   SMSF-Non-3GPP-Number

The SMSF-Non-3GPP-Number AVP is of type OctetString and it shall contain the ISDN number of the SMSF registered for Non-3GPP access. For further details on the definition of this AVP, see 3GPP TS 23.003 [3]. This AVP contains an SMSF-Non-3GPP-Number in international number format as described in ITU-T Rec E.164 [13] and shall be encoded as a TBCD-string. See 3GPP TS 29.002 [9] for encoding of TBCD-strings. This AVP shall not include leading indicators for the nature of address and the numbering plan; it shall contain only the TBCD-encoded digits of the address.

5.3.3.31   SMSF-3GPP-Name

The SMSF-3GPP-Name AVP is of type DiameterIdentity and it shall contain the Diameter identity of the serving SMSF registered for 3GPP access. For further details on the encoding of this AVP, see IETF RFC 6733 [20].

5.3.3.32   SMSF-Non-3GPP-Name

The SMSF-Non-3GPP-Name AVP is of type DiameterIdentity and it shall contain the Diameter identity of the serving SMSF registered for Non-3GPP access. For further details on the encoding of this AVP, see IETF RFC 6733 [20].

5.3.3.33   SMSF-3GPP-Realm

The SMSF-3GPP-Realm AVP is of type DiameterIdentity and it shall contain the Diameter Realm Identity of the serving SMSF registered for 3GPP access. For further details on the encoding of this AVP, see IETF RFC 6733 [20].

5.3.3.34   SMSF-Non-3GPP-Realm

The SMSF-Non-3GPP-Realm AVP is of type DiameterIdentity and it shall contain the Diameter Realm Identity of the serving SMSF registered for Non-3GPP access. For further details on the encoding of this AVP, see
IETF RFC 6733 [20].

5.3.3.35   SMSF-3GPP-Address

The SMSF-3GPP-Address AVP is of type Grouped. This AVP shall contain the information about the SMSF serving the targeted user for 3GPP access.

AVP format

        SMSF-3GPP-Address ::=   <AVP header: 3344 10415>

                        [SMSF-3GPP-Number]

                        [SMSF-3GPP-Name]

                        [SMSF-3GPP-Realm]

                        *[AVP]

5.3.3.36   SMSF-Non-3GPP-Address

The SMSF-Non-3GPP-Address AVP is of type Grouped. This AVP shall contain the information about the SMSF serving the targeted user for Non-3GPP access.

AVP format

        SMSF-Non-3GPP-Address ::= <AVP header: 3345 10415>

                        [SMSF-Non-3GPP-Number]

                        [SMSF-Non-3GPP-Name]

                        [SMSF-Non-3GPP-Realm]

                        *[AVP]

5.4   User identity to HSS resolution

The User identity to HSS resolution mechanism enables the SMS-GMSC or SMS Router in the home PLMN or Diameter proxy agents in the home PLMN to find the identity of the HSS that holds the subscriber data for a given user identified by its MSISDN or by its IMSI when multiple and separately addressable HSSs have been deployed in the home PLMN. The resolution mechanism is not required in PLMNs that utilise a single HSS.

This User identity to HSS resolution mechanism may rely on routing capabilities provided by Diameter and be implemented in the home PLMN within dedicated Diameter Agents (Proxy Agents) responsible for determining the HSS identity based on the provided user identity. If this Diameter based implementation is selected by the home PLMN operator, the principles described below shall apply.

When more than one independently addressable HSS are deployed in the home PLMN, each SMS-GMSC or SMS-Router network of the home PLMN shall be configured with the address/identity of a Diameter Agent (Proxy Agent) implementing this resolution mechanism.

Diameter Relay agents and/or Diameter Proxy agents in the home PLMN receiving the Diameter signalling from SMS-GMSC located in other PLMNs shall be configured with the address/identity of a Diameter Agent (Proxy Agent) implementing this resolution mechanism.

To get the HSS identity that holds the subscriber data for a given user identity in the home network, the Diameter request normally destined to the HSS shall be sent to the pre-configured address/identity of a Diameter Proxy agent supporting the User identity to HSS resolution mechanism.

- If this Diameter request is received by a Diameter Redirect Agent, the Diameter Redirect Agent shall determine the HSS identity based on the provided user identity (i.e. MSISDN or IMSI) and shall return a notification of redirection towards the HSS identity, in response to the Diameter request. Multiple HSS identities may be included in the response, as specified in IETF RFC 6733 [20]. In such a case, the requesting Diameter entity shall send the Diameter request to the first HSS identity in the ordered list received in the Diameter response from the Diameter Redirect Agent. If no successful response to the Diameter request is received, the requesting Diameter entity shall send a Diameter request to the next HSS identity in the ordered list. This procedure shall be repeated until a successful response from an HSS is received. After the user identity to HSS resolution, the MME or the SGSN shall store the determined HSS identity/name/Realm and shall use it in further Diameter requests to the same user identity.

- If this Diameter request is received by a Diameter Proxy Agent, the Diameter Proxy Agent shall determine the HSS identity based on the provided user identity (i.e. MSISDN or IMSI) and shall forward the Diameter request directly to the HSS. In this case, the user identity to HSS resolution decision is communicated to the SMS-GMSC in the Origin-Host/Origin-Realm AVPs of the response.

NOTE: Alternatives to the user identity to HSS resolution Diameter based implementation are outside the scope of this specification.

The User identity to HSS resolution mechanism, in a retry context of SMS for IMS UE to IMS UE without MSISDN (see 3GPP TS 23.204 [17]), applies as described in this clause for requests issued by the SMS-SC to a HSS and where the IMSI of the user is replaced by the HSS ID of the HSS storing the subscription data of the user.

6 Diameter based SGd/Gdd interfaces between MME/SGSN and central SMS functions

6.1 Introduction

The SGd interface enables the transfer of short messages between the MME, the SMS-IWMSC, the SMS-GMSC and the SMS Router, and the alerting of the SMS-GMSC by the MME (possibly via an SMS Router), as described in 3GPP TS 23.040 [3].

The Gdd interface enables the transfer of short messages between the SGSN, the SMS-IWMSC, the SMS-GMSC and the SMS Router, and the alerting of the SMS-GMSC by the SGSN (possibly via an SMS Router) as described in 3GPP TS 23.040 [3].

6.2 Procedures description

6.2.1 MO Forward Short Message procedure

6.2.1.1 General

This procedure shall be used between the serving MME or SGSN or IP-SM-GW and the SMS-IWMSC to forward mobile originated short messages from a mobile user to a Service Centre.

This procedure is used according to the call flows described in 3GPP TS 23.040 [3] clause 10.

This procedure may also be used between the SMS-IWMSC and the MTC-IWF to forward mobile originated short messages from a mobile user to an MTC-IWF; see 3GPP TS 23.682 [18].

Table 6.2.1.1/1 specifies the involved information elements for the request.

Table 6.2.1.1/2 specifies the involved information elements for the answer.

This procedure is mapped to the commands MO-Forward-Short-Message-Request/Answer (OFR/OFA) in the Diameter application specified in clause 6.3.2.

Table 6.2.1.1/1: MO Forward Short Message Request

Information element name	Mapping to Diameter AVP	Cat.	Description
SM RP DA	SC-Address	M	When used between MME or SGSN or IP-SM-GW and SMS-IWMSC, this information element shall contain the Service Centre address received from the mobile station. When used between SMS-IWMSC and MTC-IWF, this information element shall contain the MTC-IWF address as pre-configured in the SMS-SC.
SM RP OA	User-Identifier	M	This information element shall contain: - the IMSI if it is available; - the MSISDN of the user when it exists. - a dummy MSISDN value in the context of MSISDN-less SMS delivery in IMS (see 3GPP TS 23.204 [17]), if IMSI is not available. In this case the originating user is identified by the Originating SIP-URI (see SMSMI-Correlation ID).
SM RP UI	SM-RP-UI	M	This information element shall contain the short message transfer protocol data unit
SMSMI-Correlation ID	SMSMI-Correlation-ID	C	This information element indicates by its presence that the request is sent in the context of MSISDN-less SMS delivery in IMS (see 3GPP TS 23.204 [17]). When present, this information element shall contain an HSS-ID identifying the destination user's HSS, a Destination SIP-URI identifying the MSISDN-less destination user, and an Originating SIP-URI identifying the MSISDN-less originating user.
OFR Flags	OFR-Flags	C	This information element shall contain a bit mask. See 6.3.3.12 for the meaning of the bits.
SM Delivery Outcome	SM-Delivery-Outcome	C	This information element shall be present if the SMSMI Correlation ID is present and shall contain the IP-SM-GW SM Delivery Outcome with the causes for setting the message waiting data in the HSS.
Supported Features	Supported-Features	O	If present, this information element shall contain the list of features supported by the origin host.

NOTE: In the context of MSISDN-less SMS delivery in IMS (see 3GPP TS 23.204 [17]), the IP-SM-GW gets the HSS-ID and the SM Delivery Outcome from the SIP message coming from the IMS network of the destination user and indicating a temporary SMS delivery failure.

Table 6.2.1.1/2: MO-Forward Short Message Answer

Information element name	Mapping to Diameter AVP	Cat.	Description

Result	Result-Code / Experimental-Result	M	This information element shall contain the result of the operation.
			The Result-Code AVP shall be used to indicate success / errors as defined in the Diameter base protocol (see IETF RFC 6733 [20]).
			The Experimental-Result AVP shall be used for SGd/Gdd/T4 errors. This is a grouped AVP which shall contain the 3GPP Vendor ID in the Vendor-Id AVP, and the error code in the Experimental-Result-Code AVP. The following errors are applicable:
			   - Facility Not Supported;
			   - SM Delivery Failure.

SM Delivery Failure Cause	SM-Delivery-Failure-Cause	C	If the Experimental-Result-Code is set to DIAMETER_ERROR_SM_DELIVERY_FAILURE, this information element shall be present and indicate one of the following:
			   - unknown Service Centre/MTC-IWF address;
			   - Service Centre/MTC-IWF congestion;
			   - invalid Short Message Entity address;
			   - user not Service Centre/SCS-AS user.
			It may be completed with a Diagnostic information element.

SM RP UI	SM-RP-UI	O	If present, this information element shall contain a short message transfer protocol data unit in the message delivery acknowledgement from the SMS-IWMSC to the MME or SGSN
Supported Features	Supported-Features	O	If present, this information element shall contain the list of features supported by the origin host.
External-Identifier	External-Identifier	C	This information element shall contain the External Identifier identifying the sender of the short message. Shall be present when the answer is sent over T4 to the SMS-IWMSC for charging.

6.2.1.2 Detailed behaviour of the MME, the SGSN and the IP-SM-GW

When the "SMS in MME" feature is applied for the UE, the MME shall make use of this procedure to forward mobile originated short messages received from the UE to the SMS-IWMSC associated to the SMS-SC indicated by the UE.

When the SGSN supports the SMS service for the UE, the SGSN shall make use of this procedure to forward mobile originated short messages received from the UE to the SMS-IWMSC associated to the SMS-SC indicated by the UE.

The IP-SM-GW shall make use of this procedure to forward mobile originated short messages received from the UE to the SMS-IWMSC associated to the SMS-SC indicated by the UE. This procedure shall be also used in the context of MSISDN-less SMS delivery in IMS (see 3GPP TS 23.204 [17]), when the direct SMS delivery has failed,

The MME or the SGSN shall check if the SMS related subscription data (e.g. ODB data and Call Barring) allows forwarding the short message.

6.2.1.3 Detailed behaviour of the SMS-IWMSC

When receiving the MO Forward Short Message Request, the SMS-IWMSC shall check if the SMS-SC is known, if it is not, an Experimental-Result-Code set to DIAMETER_ERROR_SM_DELIVERY_FAILURE and a SM Delivery Failure Cause indicating "unknown Service Centre address" shall be returned to the MME or the SGSN.

The SMS IWMSC shall then pass the short message to the addressed SMS-SC, or, if the destination user identity maps to an MTC-IWF based on a pre-configured mapping table, forward it to the appropriate MTC-IWF.

If the SMS-SC or MTC-IWF returns a negative acknowledgement, an Experimental-Result-Code set to DIAMETER_ERROR_SM_DELIVERY_FAILURE and a SM Delivery Failure Cause indicating the cause given by the SMC-SC or MTC-IWF shall be returned to the MME or the SGSN.

If the SMS-SC or MTC-IWF returns a positive acknowledgement to the SMS IWMSC, a Result-Code set to DIAMETER_SUCCESS shall be returned to the MME or the SGSN.

If a requested facility is not supported, an Experimental-Result-Code set to DIAMETER_ERROR_FACILITY_NOT_SUPPORTED shall be returned.

6.2.2 MT Forward Short Message procedure

6.2.2.1 General

This procedure shall be used between the SMS-GMSC and the serving MME or SGSN (transiting an SMS Router, if present) or IP-SM-GW to forward mobile terminated short messages.

This procedure is used according to the call flows described in 3GPP TS 23.040 [3] clause 10.

Table 6.2.2.1/1 specifies the involved information elements for the request.

Table 6.2.2.1/2 specifies the involved information elements for the answer.

This procedure is mapped to the commands MT-Forward-Short-Message-Request/Answer (TFR/TFA) in the Diameter application specified in clause 6.3.2.

Table 6.2.2.1/1: MT Forward Short Message Request

Information element name	Mapping to Diameter AVP	Cat.	Description
SM RP DA	User-Name (See IETF RFC 6733 [20])	M	This information element shall contain - either an IMSI - or a HSS ID value if an SMSMI-Correlation ID is present, the destination user being identified by the Destination SIP-URI within the SMSMI Correlation ID.
SM RP OA	SC-Address	M	This information element shall contain the Service Centre address.
SMSMI Correlation ID	SMSMI-Correlation-ID	C	This information element indicates by its presence that the request is sent in the context of MSISDN-less SMS delivery in IMS (see 3GPP TS 23.204 [17]). When present, this information element shall contain the Destination SIP-URI identifying the (MSISDN-less) destination user and the Originating SIP-URI identifying the (MSISDN-less) originating user. The HSS-ID shall be absent from this information element.
SM RP UI	SM-RP-UI	M	This information element shall contain the short message transfer protocol data unit.
MME Number for MT SMS	MME-Number-for-MT-SMS	C	This Information Element contains the ISDN number of the MME (see 3GPP TS 23.003 [3]) and shall be present when the request is sent to a MME.
SGSN Number	SGSN-Number	C	This Information Element contains the ISDN number of the SGSN (see 3GPP TS 23.003 [3]) and shall be present when the request is sent to a SGSN.
TFR-Flags	TFR-Flags	C	This information element shall contain a bit mask. Bit 0 indicates when set if the Service Centre has more messages to send
SM Delivery Timer	SM-Delivery-Timer	C	This information element should be included. When present, it shall indicate the SM Delivery Timer value set in the SMS-GMSC to the IP-SM-GW, MME or S4-SGSN.
SM Delivery Start Time	SM-Delivery-Start-Time	C	This information element should be included. When present, it shall indicate the timestamp (in UTC) at which the SM Delivery Supervision Timer was started in the SMS-GMSC.
Maximum Retransmission Time	Maximum-Retransmission-Time	O	This information element, when present, shall indicate the maximum retransmission time (in UTC) until which the SMS-GMSC is capable to retransmit the MT Short Message.
SMS-GMSC Address	SMS-GMSC-Address	C	This IE shall be present if the Maximum Retransmission Time IE is present in the message. When present, this IE shall contain the E.164 number of the SMS-GMSC in the request sent by the SMS-GMSC or the E.164 number of the SMS Router in the request sent by the SMS Router.
Supported Features	Supported-Features (See 3GPP TS 29.229 [5])	O	If present, this information element shall contain the list of features supported by the origin host.

Table 6.2.2.1/2: MT Forward Short Message Answer

Information element name	Mapping to Diameter AVP	Cat.	Description
Result	Result-Code / Experimental-Result	M	This information element shall contain the result of the operation. The Result-Code AVP shall be used to indicate success / errors as defined in the Diameter base protocol (see IETF RFC 6733 [20]). The Experimental-Result AVP shall be used for SGd/Gdd errors. This is a grouped AVP which shall contain the 3GPP Vendor ID in the Vendor-Id AVP, and the error code in the Experimental-Result-Code AVP. The following errors are applicable: - Unknown User; - Absent User; - User busy for MT SMS; - Illegal User; - Illegal Equipment; - SM Delivery Failure.
Absent User Diagnostic SM	Absent-User-Diagnostic-SM	O	This information element may be present when Experimental-Result-Code is set to DIAMETER_ERROR_ABSENT_USER and it shall contain the reason of the absence of the user given by the MME or the SGSN.
SM Delivery Failure Cause	SM-Delivery-Failure-Cause	C	If Experimental-Result-Code is set to DIAMETER_ERROR_SM_DELIVERY_FAILURE, this information element shall be present and indicate one of the following: - memory capacity exceeded in the mobile equipment; - UE error; - mobile equipment not equipped to support the mobile terminated short message service. It may be completed with a Diagnostic information element
SM RP UI	SM-RP-UI	O	If present, this information element shall contain a short message transfer protocol data unit in the message delivery acknowledgement from the MME to the Service Centre.
Requested Retransmission Time	Requested-Retransmission-Time	O	This information element may only be present if the Experimental-Result-Code is set to DIAMETER_ERROR_ABSENT_USER and if the Maximum Retransmission Time information element is present in the MT Forward Short Message Request. It may be included if the UE is using a power saving mechanism (such as extended idle mode DRX) and the UE is currently not reachable. When present, this shall indicate the retransmission time (in UTC) at which the SMS-GMSC is requested to retransmit the MT Short Message. The Requested Retransmission Time shall not exceed the Maximum Retransmission Time received from the SMS-GMSC.
User Identifier Alert	User-Identifier	C	This IE shall be present in the message from the SMS Router to the SMS-GMSC, if the Requested Retransmission Time IE is present in the message. When present, this information shall contain an MT Correlation ID (encoded in the User-Name AVP).
Supported Features	Supported-Features (See 3GPP TS 29.229 [5])	O	If present, this information element shall contain the list of features supported by the origin host.

6.2.2.2 Detailed behaviour of the MME and the SGSN

When receiving a MT Forward Short Message Request, the MME or the SGSN shall check if the IMSI is known,

If it is not known, an Experimental-Result-Code set to DIAMETER_ERROR_USER_UNKNOWN shall be returned.

The MME or the SGSN shall attempt to deliver the short message to the UE.

If the delivery of the short message to the UE is successful, the MME or the SGSN shall return a Result-Code set to DIAMETER_SUCCESS.

If the UE is not reachable via the MME, the MME shall set the MNRF flag and shall return an Experimental-Result-Code set to DIAMETER_ERROR_ABSENT_USER.

If the UE is not reachable via the SGSN, the SGSN shall set the MNRG flag and shall return an Experimental-Result-Code set to DIAMETER_ERROR_ABSENT_USER.

If the UE is using extended idle mode DRX (as defined in 3GPP TS 23.682 [18]) and the UE is expected to not respond to paging shortly or within the time frame indicated by the SM-Delivery-Timer and SM-Delivery-Start-Time IEs, the MME or SGSN may behave as specified above for a UE that is not reachachable, while still paging the UE.

> NOTE 1: This mechanism is not intended for UEs which are known to wake up shortly (e.g. within the next 10 seconds) as enough time needs to elapse, between the sending of the MT Forward Short Message Answer and the subsequent Notification procedure towards the HSS when the UE becomes reachable, to enable the Report SM Delivery Status procedure to take place beforehand from the SMS-GMSC to the HSS.

If the UE is using extended idle mode DRX (as defined in 3GPP TS 23.682 [18]) and the UE is expected to respond to paging shortly or within the time frame indicated by the SM-Delivery-Timer and SM-Delivery-Start-Time IEs, the MME or SGSN should page the UE and attempt to deliver the short message to the UE.

If the UE is using a power saving mechanism such as extended idle mode DRX (see 3GPP TS 23.682 [18]), and if the MT Forward Short Message Request includes the Maximum-Retransmission-Time AVP, the MME or SGSN may return an MT Forward Short Message Answer with the Experimental-Result-Code set to DIAMETER_ERROR_ABSENT_USER and with the Requested-Retransmission-Time AVP requesting the SMS-GMSC to retransmit the Short Message at a later time prior to the Maximum Retransmission Time. In that case, the MME or SGSN shall store (if not already done) the Origin-Host, the Origin-Realm and the SMS-GMSC address received in request and shall not set the MNRF or MNRG flag.

> NOTE 2: This mechanism does not cause additional signalling at the HSS to retransmit the Short Message.

If the delivery of the mobile terminated short message failed because of memory capacity exceeded or UE error or UE not SM equipped, the MME or the SGSN shall return an Experimental-Result-Code set to DIAMETER_ERROR_SM_DELIVERY_FAILURE complemented with a SM Delivery Failure Cause indication.

If a requested facility is not supported, the MME or the SGSN shall return an Experimental-Result-Code set to DIAMETER_ERROR_FACILITY_NOT_SUPPORTED.

If the user is busy for MT SMS, i.e. the mobile terminated short message transfer cannot be completed because:

- another mobile terminated short message transfer is going on and the delivery node does not support message buffering; or

- another mobile terminated short message transfer is going on and it is not possible to buffer the message for later delivery; or

- the message was buffered but it is not possible to deliver the message before the expiry of the buffering time defined in 3GPP TS 23.040 [3],

the MME or the SGSN shall return an Experimental-Result-Code set to DIAMETER_ERROR_USER_BUSY_FOR_MT_SMS.

If the delivery of the mobile terminated short message failed because the mobile station failed authentication, the MME or the SGSN shall return an Experimental-Result-Code set to DIAMETER_ERROR_ILLEGAL_USER.

If the delivery of the mobile terminated short message failed because an IMEI check failed, i.e. the IMEI was prohibite-listed or not permitted-listed, the MME or the SGSN shall return an Experimental-Result-Code set to DIAMETER_ERROR_ILLEGAL_EQUIPMENT.

6.2.2.3 Detailed behaviour of the SMS-GMSC

The SMS-GMSC shall make use of this procedure over the SGd interface or over the Gdd interface for the delivery of a MT short message when it has selected the serving node of which it obtained the Diameter Identity from the answer of the Send Routing Info for SM procedure.

> NOTE: The SMS-GMSC is not aware that the MT Forward Short Message Request may be routed to a SMS router.

The SMS-GMSC may include the Maximum-Retransmission-Time AVP in the MT Forward Short Request to indicate that it is capable to retransmit the Short Message until the indicated maximum retransmission time, if the following conditions are fulfilled:

- the destination user pertains to the PLMN of the SMS-GMSC; and

- if an SMS Router is used for MT SMS sent to destination users pertaining to the PLMN of the SMS-GMSC, the SMS Router is known to support the Alert Service Centre procedure specified in clause 6.2.3.

The SMS-GMSC shall include its E.164 number in the SMS-GMSC address in the request if it also includes the Maximum-Retransmission-Time AVP.

When the SMS router has received a MT Forward Short Message from the SMS-GMSC and the SMS Router has selected the MME or the SGSN for delivery, the SMS Router shall forward it to the MME or the SGSN.

If the MT Forward Short Message Request includes the Maximum-Retransmission-Time AVP, the SMS Router shall store the SMS-GMSC Diameter Identity (received in the Origin-Host and Origin-Realm AVPs) and the SMS-GMSC address received in the request and replace them by its SMS Router Diameter Identity (in the Origin-Host and Origin-Realm AVPs) and SMS Router address (E.164 number) when forwarding the request to the MME or SGSN.

When a MT Forward Short Message Answer is received from the MME, the SMS Router shall forward it to the SMS-GMSC.

If the MT Forward Short Message Answer includes the Requested-Retransmission-Time AVP, the SMS Router shall include a User Identifier Alert AVP when forwarding the answer to the SMS-GMSC.

> NOTE: The User Identifier Alert is further used in the Alert Service Centre procedure specified in clause 6.2.3 to enable the SMS-GMSC to identify and retransmit all pending MT SMS messages towards the destination user.

6.2.3 Alert Service Centre procedure

6.2.3.1 General

This procedure shall be used between the MME or SGSN and the SMS-GMSC, possibly via an SMS Router, to indicate that a UE, for which one or more MT SMS have been requested to be retransmitted at a later time, is now available for MT SMS delivery or that it has moved under the coverage of another MME or SGSN. This procedure is used according to the call flows described in 3GPP TS 23.040 [2] clause 10.

Table 6.2.3.1-1 specifies the involved information elements for the request.

Table 6.2.3.1-2 specifies the involved information elements for the answer.

This procedure is mapped to the commands Alert-Service-Centre-Request/Answer (ALR/ALA) in the Diameter application specified in clause 5.3.2.

Table 6.2.3.1-1: Alert Service Centre Request

Information element name	Mapping to Diameter AVP	Cat.	Description
Service Centre Address	SC-Address	M	This IE shall contain the E.164 number of the SMS-GMSC (or SMS Router) previously received in the SMS-GMSC Address IE in the MT Forward Short Message Request.
User Identifier Alert	User-Identifier	M	This IE shall contain: - the IMSI when the request is sent from the MME or SGSN, - the User Identifier Alert previously sent in the MT Forward Short Message Answer, when the request is sent from the SMS Router to the SMS-GMSC, encoded in the User-Name AVP.
SMS-GMSC Alert Event	SMS-GMSC-Alert-Event	M	This IE shall contain the type of event that caused the Alert Service Centre Request to the SMS-GMSC: - UE is available for MT SMS; - UE has moved under the coverage of another MME or SGSN.
New Serving Node Identity	Serving-Node	C	This IE shall be present if available and if the SMS-GMSC Alert Event indicates that the UE has moved under the coverage of another MME or SGSN. When present, this IE shall contain the Diameter Identity and/or the E.164 number of the new serving node of the UE. It shall be encoded as: - an MME-Name, MME Realm and MME-Number-for-MT-SMS, if the new serving node is an MME; - an SGSN-Number and, an SGSN-Name and SGSN Realm if available, if the new serving node is an SGSN.
Supported Features	Supported-Features (See 3GPP TS 29.229 [5])	O	If present, this information element shall contain the list of features supported by the origin host.

Table 6.2.3.1-2: Alert Service Centre Answer

Information element name	Mapping to Diameter AVP	Cat.	Description
Result	Result-Code / Experimental-Result	M	This information element shall contain the result of the request. The Result-Code AVP shall be used for errors defined in the Diameter base protocol (see IETF RFC 6733 [20]). The Experimental-Result AVP shall be used for S6c errors. This is a grouped AVP which contains the 3GPP Vendor ID in the Vendor-Id AVP, and the error code in the Experimental-Result-Code AVP. This information element shall contain the result of the operation with an indication of the success / errors. No errors are defined for this case.
Supported Features	Supported-Features (See 3GPP TS 29.229 [5])	O	If present, this information element shall contain the list of features supported by the origin host.

6.2.3.2 Detailed behaviour of the MME and the SGSN

The MME or SGSN shall make use of this procedure to alert the SMS-GMSC when the UE, for which one or more MT SMS have been requested to be retransmitted at a later time, becomes available for MT SMS delivery or moves under the coverage of another MME or SGSN prior to the requested SM retransmission time.

The MME or SGSN shall delete the stored SMS-GMSC Diameter Identity (i.e. Origin-Host and Origin-Realm) and address after the Alert Service Centre procedure is completed.

6.2.3.3   Detailed behaviour of the SMS-GMSC

When receiving an Alert Service Centre request, the SMS-GMSC shall retransmit pending MT SMS(s) for the destination user identified by the User Identifier Alert, to the same serving node if the SMS-GMSC Alert Event indicates that the UE is available for MT SMS, or to the new serving node if the SMS-GMSC Alert Event indicates that the UE has moved under the coverage of another MME or SGSN. In the latter case, if no New Serving Node Identity is received in the Alert Service Centre request, the SMS-GMSC shall initiate a Send Routing Info for SM procedure to retrieve the new serving node 's address from the HSS.

6.2.3.4   Detailed behaviour of the SMS-Router

When receiving an Alert Service Centre request, the SMS-Router shall replace the IMSI received in the User Identifier Alert by the User Identifier Alert previously sent in the MT Forward Short Message Answer, and forward that request to the SMS-GMSC.

6.3   Protocol specification

6.3.1   Routing considerations

6.3.1.1   Routing for MO Forward SM messages:

This clause specifies the use of the Diameter routing AVPs Destination-Realm and Destination-Host over the SGd or Gdd interfaces for the Diameter command requests from the MME or from the SGSN (i.e. for the MO forward SM procedure).

Also, this clause specifies the use of the Diameter routing AVPs Destination-Realm and Destination-Host over the T4 interface for the Diameter command requests from the SMS-IWMSC (i.e. for the MO forward SM procedure).

This clause also applies for the Diameter command MO forward SM request from the IP-SM-GW towards an SMS-SC/SMS-IWMSC, including the case where the MO forward SM request occurs in the retry context of SMS for IMS UE to IMS UE without MSISDN (see 3GPP TS 23.204 [17]). MME or SGSN is replaced by IP-SM-GW in the text of this clause.

If the MME or the SGSN, from the SMS-SC E.164 number received from the UE, can obtain the address/name of the SMS-IWMSC and the associated home network domain name (e.g. by local configuration), both the Destination-Realm and Destination-Host AVPs shall be present in the request.

If the MME or the SGSN, from the SMS-SC E.164 number received from the UE, can only obtain the MCC/MNC values of the PLMN to which the SMS-SC belongs, the MME or the SGSN shall use them to build the MCC/MNC based network domain as described in clause 19.2 of 3GPP TS 23.003 [16] and include it in the Destination-Realm AVP of the request. The request shall then be routed to the next Diameter node.

If the MME or the SGSN cannot obtain the MCC/MNC values from the SMS-SC E.164 number, the MME or the SGSN shall forward the request to a Diameter node within the same PLMN, the Destination Realm content being left to the PLMN operator choice. Then:

- if a Diameter node in the routing path insides the PLMN of the MME can obtain the MCC/MNC values of the PLMN to which the SMS-SC belongs,

- it shall use them to build the MCC/MNC based network domain as described in clause 19.2 of 3GPP TS 23.003 [16] and include it in the Destination-Realm AVP of the request. The request shall then be routed to the next Diameter node.

If the MCC/MNC values of the PLMN to which the SMS-SC belongs cannot be obtained in the PLMN of the MME or the SGSN, the request shall be replaced in the PLMN of the MME or the SGSN by an equivalent request routed through a MAP interface (e.g. via an IWF).

NOTE 1: The inter PLMN routing principle is to reuse the routing based on a MCC/MNC based domain name as used by other Diameter applications such as S6a/d. It is assumed that obtaining the relevant MCC/MNC values from the E.164 number of the SMS-SC can be achieved in the PLMN which the MME belongs to. Otherwise a MAP based routing is used. This routing principle may be completed with other routing solutions in the future.

Consequently, the Destination-Host AVP is declared as optional in the ABNF for all requests initiated by an MME or a SGSN.

The SMS-IWMSC shall be able to obtain the address/name of the MTC-IWF and the associated home network domain name from the destination SME address included in the MO TPDU (e.g. by local configuration); therefore both the Destination-Realm and Destination-Host AVPs shall be present in the request.

6.3.1.2 Routing for MT Forward SM messages:

This clause specifies the use of the Diameter routing AVPs Destination-Realm and Destination-Host for the Diameter command requests from the SMS-GMSC or the SMS Router (i.e. for the MT forward SM procedure).

- if the SMS-GMSC has received the Diameter address/name of an MME or of the SGSN in the answer to its interrogation to the HSS/HLR for retrieving routing information and if it selects this serving node, it shall use it to populate the Destination-Realm and Destination-Host AVPs.

- If the SMS Router has received the Diameter address/name of the MME or of the SGSN in the answer to its interrogation to the HSS/HLR for retrieving routing information and if it selects this serving node, it shall use this Diameter address/name to populate the Destination-Realm and Destination-Host AVPs.

Consequently, the Destination-Host AVP is declared as mandatory in the ABNF for all requests initiated by an SMS-GMSC or a SMS router.

6.3.2 Commands

6.3.2.1 Introduction

This clause defines the Command code values and related ABNF for each command described for the SGd interface.

6.3.2.2 Command-Code values

This clause defines the Command-Code values for the SGd interface application as allocated by IANA in the IETF RFC 5516 [8], the SGd interface application being used over the SGd and Gdd interfaces. The Alert Service Centre procedure used over the SGd and Gdd interfaces also uses commands of the S6c interface application.

Every command is defined by means of the ABNF syntax IETF RFC 2234 [6], according to the Command Code Format (CCF) specification defined in IETF RFC 6733 [20]. In the case, the definition and use of an AVP is not specified in this document, the guidelines in IETF RFC 6733 [20] shall apply.

The Vendor-Specific-Application-Id AVP shall not be included in any command sent by Diameter nodes supporting applications defined in this specification. If the Vendor-Specific-Application-Id AVP is received in any of the commands defined in this specification, it shall be ignored by the receiving node.

NOTE: The Vendor-Specific-Application-Id is included as an optional AVP in all Command Code Format specifications defined in this specification in order to ensure potential interoperability issues with Diameter agents non-compliant with IETF RFC 6733 [20].

The following Command Codes are defined in this specification:

Table 6.3.2.2/1: Command-Code values for SGd/Gdd

Command-Name	Abbreviation	Code	Clause
MO-Forward-Short-Message Request	OFR	8388645	6.3.2.3
MO-Forward-Short-Message Answer	OFA	8388645	6.3.2.4
MT-Forward-Short-Message Request	TFR	8388646	6.3.2.5
MT-Forward-Short-Message Answer	TFA	8388646	6.3.2.6
Alert-Service-Centre-Request	ALR	8388648	5.3.2.5
Alert-Service-Centre-Answer	ALA	8388648	5.3.2.6

For these commands, the Application-ID field shall be set to 16777313 (application identifier of the SGd interface application, allocated by IANA), except for the ALR/ALA commands for which the Application-ID field shall be set to 16777312 (application identifier of the S6c interface application, allocated by IANA).

6.3.2.3 MO-Forward-Short-Message-Request (OFR) Command

The MO-Forward-Short-Message-Request (OFR) command, indicated by the Command-Code field set to 8388645 and the "R" bit set in the Command Flags field, is sent from the MME / SGSN to the SMS-IWMSC and it is also sent from the SMS-IWMSC to the MTC-IWF.

Message Format

```
< MO-Forward-Short-Message-Request > ::= < Diameter Header: 8388645, REQ, PXY, 16777313 >
                            < Session-Id >
                            [ DRMP ]
                            [ Vendor-Specific-Application-Id ]
                            { Auth-Session-State }
                            { Origin-Host }
                            { Origin-Realm }
                            [ Destination-Host ]
                            { Destination-Realm }
                            { SC-Address }
                            [ OFR-Flags ]
                            *[ Supported-Features ]
                            { User-Identifier }
                            { SM-RP-UI }
                            [ SMSMI-Correlation-ID ]
                            [ SM-Delivery-Outcome ]
                            *[ AVP ]
                            *[ Proxy-Info ]
                            *[ Route-Record ]
```

6.3.2.4 MO-Forward-Short-Message-Answer (OFA) Command

The MO-Forward-Short-Message-Answer Command (OFA) command, indicated by the Command-Code field set to 8388645 and the 'R' bit cleared in the Command Flags field, is sent from the SMS-IWMSC to the MME / SGSN and it is also sent from the MTC-IWF to the SMS-IWMSC.

Message Format

```
< MO-Forward-Short-Message-Answer > ::= < Diameter Header: 8388645, PXY, 16777313 >
                            < Session-Id >
                            [ DRMP ]
                            [ Vendor-Specific-Application-Id ]
                            [ Result-Code ]
                            [ Experimental-Result ]
                            { Auth-Session-State }
                            { Origin-Host }
                            { Origin-Realm }
                            *[ Supported-Features ]
                            [ SM-Delivery-Failure-Cause ]
                            [ SM-RP-UI ]
```

           [External-Identifier]
           *[AVP]
           [Failed-AVP]
           *[Proxy-Info]
           *[Route-Record]

6.3.2.5 MT-Forward-Short-Message-Request (TFR) Command

The MT-Forward-Short-Message-Request (TFR) command, indicated by the Command-Code field set to 8388646 and the "R" bit set in the Command Flags field, is sent from the SMS-GMSC to the MME / SGSN (transiting an SMS Router, if present).

Message Format

    < MT-Forward-Short-Message-Request > ::= < Diameter Header: 8388646, REQ, PXY, 16777313 >
                      < Session-Id >
                      [DRMP]
                      [Vendor-Specific-Application-Id]
                      { Auth-Session-State }
                      { Origin-Host }
                      { Origin-Realm }
                      { Destination-Host }
                      { Destination-Realm }
                      { User-Name }
                      *[Supported-Features]
                      [SMSMI-Correlation-ID]
                      { SC-Address }
                      { SM-RP-UI }
                      [MME-Number-for-MT-SMS]
                      [SGSN-Number]
                      [TFR-Flags]
                      [SM-Delivery-Timer]
                      [SM-Delivery-Start-Time]
                      [Maximum-Retransmission-Time]
                      [SMS-GMSC-Address]
                      *[AVP]
                      *[Proxy-Info]
                      *[Route-Record]

6.3.2.6 MT-Forward-Short-Message-Answer (TFA) Command

The MT-Forward-Short-Message-Answer Command (TFA) command, indicated by the Command-Code field set to 8388646 and the 'R' bit cleared in the Command Flags field, is sent from the MME / SGSN to the SMS-GMSC (transiting an SMS Router, if present).

Message Format

    < MT-Forward-Short-Message-Answer > ::= < Diameter Header: 8388646, PXY, 16777313 >
                      < Session-Id >
                      [DRMP]
                      [Vendor-Specific-Application-Id]
                      [Result-Code]
                      [Experimental-Result]
                      { Auth-Session-State }
                      { Origin-Host }
                      { Origin-Realm }
                      *[Supported-Features]
                      [Absent-User-Diagnostic-SM]
                      [SM-Delivery-Failure-Cause]
                      [SM-RP-UI]
                      [Requested-Retransmission-Time]
                      [User-Identifier]

```
*[ AVP ]
[ Failed-AVP ]
*[ Proxy-Info ]
*[ Route-Record ]
```

6.3.3   AVPs

6.3.3.1   General

The following table specifies the Diameter AVPs defined for the SGd/Gdd interface protocol, their AVP Code values, types, possible flag values and whether or not the AVP may be encrypted. The Vendor-ID header of all AVPs defined in this specification shall be set to 3GPP (10415).

For all AVPs which contain bit masks and are of the type Unsigned32, e.g., TFR-Flags, bit 0 shall be the least significant bit. For example, to get the value of bit 0, a bit mask of 0x0001 should be used.

Table 6.3.3.1/1: SGd/Gdd specific Diameter AVPs

Attribute Name	AVP Code	Clause defined	Value Type	AVP Flag rules				May Encr.
				Must	May	Should not	Must not	
SC-Address	3300	6.3.3.2	OctetString	M, V				No
SM-RP-UI	3301	6.3.3.3	OctetString	M, V				No
TFR-Flags	3302	6.3.3.4	Unsigned32	M, V				No
SM-Delivery-Failure-Cause	3303	6.3.3.5	Grouped	M, V				No
SM-Enumerated-Delivery-Failure-Cause	3304	6.3.3.6	Enumerated	M, V				No
SM-Diagnostic-Info	3305	6.3.3.7	OctetString	M, V				No
SM-Delivery-Timer	3306	6.3.3.10	Unsigned32	M, V				No
SM-Delivery-Start-Time	3307	6.3.3.11	Time	M, V				No
SMSMI-Correlation-ID	3324	6.3.3.13	Grouped	V			M	No
HSS-ID	3325	6.3.3.14	OctetString	V			M	No
Originating-SIP-URI	3326	6.3.3.15	UTF8String	V			M	No
Destination-SIP-URI	3327	6.3.3.16	UTF8String	V			M	No
OFR-Flags	3328	6.3.3.12	Unsigned32	V			M	No
Maximum-Retransmission-Time	3330	6.3.3.17	Time	V			M	No
Requested-Retransmission-Time	3331	6.3.3.18	Time	V			M	No
SMS-GMSC-Address	3332	6.3.3.19	OctetString	V			M	No
NOTE 1: The AVP header bit denoted as "M", indicates whether support of the AVP is required. The AVP header bit denoted as "V" indicates whether the optional Vendor-ID field is present in the AVP header. For further details, see IETF RFC 6733 [20].								
NOTE 2: If the M-bit is set for an AVP and the receiver does not understand the AVP, it shall return a rejection. If the M-bit is not set for an AVP, the receiver shall not return a rejection, whether or not it understands the AVP. If the receiver understands the AVP but the M-bit value does not match with the definition in this table, the receiver shall ignore the M-bit.								

The following table specifies the Diameter AVPs re-used from existing Diameter Applications, including a reference to their respective specifications and when needed, a short description of their use within this interface.

Any other AVPs from existing Diameter Applications, except for the AVPs from Diameter base protocol specified in IETF RFC 6733 [20], do not need to be supported. The AVPs from Diameter base protocol specified in IETF RFC 6733 [20] are not included in table 6.3.3.1/2, but they may be re-used for this interface.

Table 6.3.3.1/2: SGd/Gdd re-used Diameter AVPs

Attribute Name	Reference	Comments	M-bit
User-Name	IETF RFC 6733 [20]		Must
User-Identifier	3GPP TS 29.336 [15]		
MME-Number-for-MT-SMS	3GPP TS 29.272 [4]		
SGSN-Number	3GPP TS 29.272 [4]		Must not
Absent-User-Diagnostic-SM	3GPP TS 29.338	It is defined for the S6c interface, see clause 5.3.3.20	
Supported-Features	3GPP TS 29.229 [5]		
Feature-List-ID	3GPP TS 29.229 [5]	See clause 6.3.3.8	
Feature-List	3GPP TS 29.229 [5]	See clause 6.3.3.9	
DRMP	IETF RFC 7944 [19]	see clause 6.3.3.20	Must not set
External-Identifier	3GPP TS 29.336 [15]		Must not
NOTE 1: The M-bit settings for re-used AVPs override those of the defining specifications that are referenced. Values include: "Must set", "Must not set". If the M-bit setting is blank, then the defining specification applies.			
NOTE 2: If the M-bit is set for an AVP and the receiver does not understand the AVP, it shall return a rejection. If the M-bit is not set for an AVP, the receiver shall not return a rejection, whether or not it understands the AVP. If the receiver understands the AVP but the M-bit value does not match with the definition in this table, the receiver shall ignore the M-bit.			

6.3.3.2   SC-Address

The SC-Address AVP is of type OctetString and it shall contain the E.164 number of the SMS-SC or MTC-IWF, in international number format as described in ITU-T Recommendation E.164 [13] and encoded as a TBCD-string. See 3GPP TS 29.002 [9] for encoding of TBCD-strings. This AVP shall not include leading indicators for the nature of address and the numbering plan; it shall contain only the TBCD-encoded digits of the address.

6.3.3.3   SM-RP-UI

The SM-RP-UI is of type OctetString and it shall contain a short message transfer protocol data unit (TPDU) which is defined in 3GPP TS 23.040 [3] and represents the user data field carried by the short message service relay sub-layer protocol. Its maximum length is of 200 octets.

6.3.3.4   TFR-Flags

The TFR-Flags AVP is of type Unsigned32 and it shall contain a bit mask. The meaning of the bits shall be as defined in table 6.3.3.4/1:

Table 6.3.3.4/1: TFR-Flags

Bit	Name	Description
0	More-Messages-To-Send	This bit, when set, shall indicate that the service centre has more short messages to send.
NOTE 1: Bits not defined in this table shall be cleared by the sending entity and discarded by the receiving entity.		

6.3.3.5 SM-Delivery-Failure-Cause

The SM-Delivery-Failure-Cause AVP is of type Grouped. It shall contain information about the cause of the failure of a SM delivery with an optional Diagnostic information.

The AVP format shall conform to:

> SM-Delivery-Failure-Cause ::= <AVP header: 3304 10415>
>
> > { SM-Enumerated-Delivery-Failure-Cause }
> >
> > [SM-Diagnostic-Info]
> >
> > *[AVP]

6.3.3.6 SM-Enumerated-Delivery-Failure-Cause

The SM-Enumerated-Delivery-Failure-Cause AVP is of type enumerated and it shall contain the cause of the failure of a SM delivery. The following values are defined:

MEMORY_CAPACITY_EXCEEDED (0),

EQUIPMENT_PROTOCOL_ERROR (1),

EQUIPMENT_NOT_SM-EQUIPPED (2),

UNKNOWN_SERVICE_CENTRE (3),

SC-CONGESTION (4),

INVALID_SME-ADDRESS (5),

USER_NOT_SC-USER (6).

> NOTE: The values of the SM- Enumerated-Delivery-Failure-Cause AVP correspond to the ones for the SM-EnumeratedDeliveryFailureCause parameter in MAP as described in 3GPP TS 29.002[9].

6.3.3.7 SM-Diagnostic-Info

The SM-Diagnostic-Info AVP is of type OctetString and it shall contain a complementary information associated to the SM Delivery Failure cause.

6.3.3.8 Feature-List-ID AVP

The syntax of this AVP is defined in 3GPP TS 29.229 [5]. For this release, the Feature-List-ID AVP value shall be set to 1.

6.3.3.9 Feature-List AVP

The syntax of this AVP is defined in 3GPP TS 29.229 [5]. A null value indicates that there is no feature used by the application.

> NOTE: There is no feature defined for this release.

6.3.3.10 SM-Delivery-Timer

The SM-Delivery-Timer is of type Integer and it shall contain the value in seconds of the timer for SM Delivery.

6.3.3.11 SM-Delivery-Start-Time

The SM-Delivery-Start-Time is of type Time and in shall contain the timestamp (in UTC) at which the SM Delivery Supervision Timer was started.

6.3.3.12   OFR-Flags

The OFR-Flags AVP is of type Unsigned32 and it shall contain a bit mask. The meaning of the bits shall be as defined in table 6.3.3.12/1:

Table 6.3.3.12/1: OFR-Flags

Bit	Name	Description
0	S6a/S6d-Indicator	This bit, when set, indicates that the OFR message is sent on the Gdd interface, i.e. the source node is an SGSN (or a combined MME/SGSN to which the UE is attached via UTRAN). This bit, when cleared, indicates that the OFR message is sent on the SGd interface, i.e. the source node is an MME (or a combined MME/SGSN to which the UE is attached via UTRAN or GERAN).

6.3.3.13   SMSMI-Correlation-ID

The SMSMI-Correlation-ID AVP is of type Grouped. It shall contain information identities used in the context of MSISDN-less SMS delivery in IMS (see 3GPP TS 23.204 [17]).

The AVP format shall conform to:

> SMS-MI-Correlation-ID ::= <AVP header: 3308 10415>
>
>> [HSS-ID]
>>
>> [Originating-SIP-URI]
>>
>> [Destination-SIP-URI]
>>
>> *[AVP]

6.3.3.14   HSS-ID

The HSS-ID AVP is of typeUTF8String. The definition and the composition of the HSS-ID are specified in 3GPP TS 23.003 [16].

6.3.3.15   Originating-SIP-URI

The Originating-SIP-URI AVP is of type UTF8String. It shall contain the Public identity of the IMS UE without MSISDN which is the sender of a short message, in the context of MSISDN-less SMS delivery in IMS (see 3GPP TS 23.204 [17]).

6.3.3.16   Destination-SIP-URI

The Destination-SIP-URI AVP is of type UTF8String. It shall contain the Public identity of the IMS UE without MSISDN which is the recipient of a short message, in the context of MSISDN-less SMS delivery in IMS (see 3GPP TS 23.204 [17]).

6.3.3.17   Maximum-Retransmission-Time

The Maximum-Retransmission-Time is of type Time and in shall contain the maximum retransmission time (in UTC) until which the SMS-GMSC is capable to retransmit the MT Short Message.

6.3.3.18   Requested-Retransmission-Time

The Requested-Retransmission-Time is of type Time and in shall contain the timestamp (in UTC) at which the SMS-GMSC is requested to retransmit the MT Short Message.

6.3.3.19   SMS-GMSC-Address

The SMS-GMSC-Address AVP is of type OctetString and it shall contain the E.164 number of the SMS-GMSC or SMS Router, in international number format as described in ITU-T Recommendation E.164 [13] and encoded as a TBCD-string. See 3GPP TS 29.002 [9] for encoding of TBCD-strings. This AVP shall not include leading indicators for the nature of address and the numbering plan; it shall contain only the TBCD-encoded digits of the address.

6.3.3.20   DRMP

The DRMP AVP is of type Enumerated and it is defined in IETF RFC 7944 [19]. This AVP allows the MME, the SGSN, the SMS-IWMSC, the SMS-GMSC, the SMS Router and the IP-SM-GW to indicate the relative priority of Diameter messages. The DRMP AVP may be used to set the DSCP marking for transport of the associated Diameter message.

7   Result Codes and Experimental-Result values

7.1   General

This clause defines result code values that shall be supported by all Diameter implementations that conform to this specification.

7.2   Success

Result codes that fall within the Success category shall be used to inform a peer that a request has been successfully completed. The Result-Code AVP values defined in Diameter base protocol specified in IETF RFC 6733 [20] shall be applied.

7.3   Permanent Failures

7.3.1   General

Errors that fall within the Permanent Failures category shall be used to inform the peer that the request has failed, and should not be attempted again. The Result-Code AVP values defined in Diameter base protocol specified in IETF RFC 6733 [20] shall be applied. When one of the result codes defined here is included in a response, it shall be inside an Experimental-Result AVP and the Result-Code AVP shall be absent.

7.3.2   DIAMETER_ERROR_USER_UNKNOWN (5001)

This result code shall be sent by the MME over the SGd interface or by the SGSN over the Gdd interface to indicate that the user identified by the IMSI is unknown.

This result code shall be sent by the SMS-IWMSC over the SGd interface to indicate that the user identified by the MSISDN is unknown.

This result code shall be sent by the HSS or the SMS Router over the S6c interface to indicate that the user identified by the MSISDN is unknown.

7.3.3   DIAMETER_ERROR_ABSENT_USER (5550)

This result code shall be sent by the MME over the SGd interface or by the SGSN over the Gdd interface to indicate that the UE is not reachable.

This result code shall be sent by the HSS or the SMS Router over the S6c interface to indicate that the UE is not reachable.

7.3.4 DIAMETER_ERROR_USER_BUSY_FOR_MT_SMS (5551)

This result code shall be sent by the MME or the SGSN when the user is busy for MT SMS.

7.3.5 DIAMETER_ERROR_FACILITY_NOT_SUPPORTED (5552)

This result code shall be sent to indicate a requested facility is not supported.

NOTE: This code corresponds to the Facility Not Supported MAP error and may be used by an IWF.

7.3.6 DIAMETER_ERROR_ILLEGAL_USER (5553)

This result code shall be sent by the MME or the SGSN to indicate that the delivery of the mobile terminated short message failed because the mobile station failed authentication.

7.3.7 DIAMETER_ERROR_ILLEGAL_EQUIPMENT (5554)

This result code shall be sent by the MME or the SGSN to indicate that the delivery of the mobile terminated short message failed because an IMEI check failed, i.e. the IMEI was prohibited-listed or not permitted-listed.

7.3.8 DIAMETER_ERROR_SM_DELIVERY_FAILURE (5555)

This result code shall be sent by the MME or the SGSN or the SMS-IWMSC to indicate that the delivery of the mobile terminated short message failed.

7.3.9 DIAMETER_ERROR_SERVICE_NOT_SUBSCRIBED (5556)

This result code shall be sent by the HSS or the SMS Router over the S6c interface to indicate that the MT SMS Teleservice is not part of the subscription.

7.3.10 DIAMETER_ERROR_SERVICE_BARRED (5557)

This result code shall be sent by the HSS or the SMS Router over the S6c interface to indicate that the MT SMS Teleservice is barred.

This result code shall be sent by the MME to indicate that the delivery of the mobile terminated short message failed because of the barring of the SMS service.

7.3.11 DIAMETER_ERROR_MWD_LIST_FULL (5558)

This result code shall be sent by the HSS over the S6c interface to indicate that the Message Waiting List is full.

7.4 Transient Failures

7.4.1 General

Result codes that fall within the transient failures category shall be used to inform a peer that the request could not be satisfied at the time it was received, but may be able to satisfy the request in the future. The Result-Code AVP values defined in Diameter base protocol specified in IETF RFC 6733 [20] shall be applied.

Annex A (normative): Diameter message priority mechanism

A.1 General

IETF RFC 7944 [19] specifies a Diameter routing message priority mechanism that allows Diameter nodes to indicate the relative priority of Diameter messages. With this information, other Diameter nodes may leverage the relative priority of Diameter messages into routing, resource allocation, set the DSCP marking for transport of the associated Diameter message, and also abatement decisions when overload control is applied.

A.2 S6c, SGd, Gdd interfaces

The Diameter message priority mechanism is an optional feature which may apply on one or several of the S6c,SGd,Gdd interfaces.

A 3GPP functional entity supporting the Diameter message priority mechanism over one or several of the S6c,SGd,Gdd interfaces shall comply with IETF RFC 7944 [19].

A 3GPP functional entity sending a request shall determine the required priority according to its policies. When priority is required, it shall include the DRMP AVP indicating the required priority level in the request it sends, and shall prioritise the request according to the required priority level.

When a 3GPP functional entity receives the corresponding response, it shall prioritise the received response according to the priority level received within the DRMP AVP if present in the response, otherwise according to the priority level of the corresponding request.

When a 3GPP functional entity receives a request, it shall handle the request according to the received DRMP AVP priority level. For the response, it may modify the priority level received in the DRMP AVP according to its policies and shall handle the response according to the required priority level. If the required priority level is different from the priority level received in the request, it shall include the DRMP AVP in the response.

The decisions of the 3GPP functional entity for a required priority and for the priority level value are implementation specific.

If:

-   a 3GPP functional entity supports using the Diameter message priority mechanism for DSCP marking purposes,

-   the transport network utilizes DSCP marking, and

-   message-dependant DSCP marking is possible for the protocol stack transporting Diameter,

then the 3GPP functional entity shall set the DSCP marking for transport of the request or response according to the required priority level.

Diameter requests related to high priority traffic shall contain a DRMP AVP with a high priority of which the level value is operator dependent.

Annex B (informative): Change history

Change history							
Date	**Meeting**	**TDoc**	**CR**	**R ev**	**Cat**	**Subject/Comment**	**New version**
2012	CT#58	CP-120762			F	TS sent for approval	
2013-03	CT#59	CP-130030	0003	2	F	Validity Time of Short Message	
2013-06	CT#60	CP-130300	0001	2	F	Diameter for SMS with SGSN General	
2013-06	CT#60	CP-130300	0002	2	F	Diameter for SMS with SGSN Complements	
2013-06	CT#60	CP-130300	0004	1	F	S6c complements related to Diameter for SMS with SGSN	
2013-09	CT#61	CP-130450	0007	1	F	Correction on Routing for MO SM	
2013-0	CT#61	CP-130456	0008	2	F	SGSN Diameter address with Gdd support	
2013-12	CT#62	CP-130800	0009	3	F	Diameter based protocols with SMS for IMS UE without MSISDN	
2014-09	CT#65	CP-140513	0010	2	F	Identification of the HSS	
2014-12	CT#66	CP-140767	0013	1	F	Corrections for some AVPs	
2014-12	CT#66	CP-140767	0011	1	F	SC-Address in SRR	
2014-12	CT#66	CP-140767	0014	-	F	AVP codes corrections for SMSMI	
2014-12	CT#66	CP-140767	0016		F	OFR-Flags AVP correction	
2015-12	CT#70	CP-150776	0017	3	F	Mobile Terminating SMS handling for extended Idle mode DRX	13.0.0
2015-12	CT#70	CP-150776	0018	1	F	Mobile Terminating SMS handling for extended Idle mode DRX – Additional Option	
2016-03	CT#71	CP-160030	0019	-	F	Alert procedure from MME/SGSN to SMS-GMSC for MT SMS to UE using eDRX	13.1.0
2016-03	CT#71	CP-160023	0020	1	F	Diameter message priority over S6c, SGd, Gdd	
2016-06	CT#72	CP-160226	0021	-	F	Missing Requested-Retransmission-Time AVP in TFA Command	13.2.0
2016-12	CT#74	CP-160664	0023		F	Correction to change IETF drmp draft version to official RFC 7944	13.3.0
2016-12	CT#74	CP-160673	0022	1	F	MO SMS over T4	14.0.0
2017-03	CT#75	CP-170036	0024		F	SMS-MO over T4	14.1.0
2017-03	CT#75	CP-170048	0025	1	F	Update of reference for the Diameter base protocol	14.1.0
2017-03	CT#75	CP-170048	0026	1	F	Handling of the Vendor-Specific-Application-Id AVP	14.1.0
2017-03	CT#75	CP-170048	0027	1	F	Cardinality of the Failed-AVP AVP in answer	14.1.0
2017-06	CT#76	CP-171018	0029	1	F	Support for signaling transport level packet marking	14.2.0
2017-09	CT#77	CP-172013	0032	-	F	Correction of DRMP Procedures	14.3.0
2017-09	CT#77	CP-172022	0030	2	F	Correction of the data type used for SC-Address and SMS-GMSC-Address	15.0.0
2018-12	CT#82	CP-183100	0033	2	F	Clarification on presence of SC-Address in SRR and on MWD Status	15.1.0
2020-06	CT#88e	CP-201016	0034	1	F	SMSF Address	15.2.0
2020-06	CT#88e	CP-201016	0035	1	F	Support of SMS in 5G	15.2.0
2020-07	-	-	-	-	-	Update to Rel-16 version (MCC)	16.0.0

2020-09	CT#89e	CP-202043	0037	-	A	SMSF Address Corrections	16.1.0
2021-03	CT#91e	CP-210053	0039	1	F	Corrections on SM-Delivery-Not-Intended	16.2.0
2021-03	CT#91e	CP-210027	0038	-	d	Inclusive language review: EIR lists	17.0.0
2022-06	CT#96	CP-221060	0040	-	F	Clarification on detailed HSS behaviour for SMS	17.1.0

History

Document history		
V17.0.0	May 2022	Publication
V17.1.0	July 2022	Publication