

ETSI TS 132 274 V15.4.0 (2022-07)



**Digital cellular telecommunications system (Phase 2+) (GSM);
Universal Mobile Telecommunications System (UMTS);
LTE;
Telecommunication management;
Charging management;
Short Message Service (SMS) charging
(3GPP TS 32.274 version 15.4.0 Release 15)**



ReferenceRTS/TSGS-0532274v40

KeywordsGSM,LTE,UMTS

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1 Scope

The present document is part of a series of Technical Specifications (TSs) that specify charging functionality and charging management in 3GPP networks. The 3GPP core network charging architecture and principles are specified in TS 32.240 [2], which provides an umbrella for other charging management TSs that specify:

- the content of the CDRs per domain / subsystem / service (offline charging);
- the content of real-time charging messages per domain / subsystem / service (online charging);
- the functionality of online and offline charging for those domains / subsystems / services;
- the interfaces that are used in the charging framework to transfer the charging information (i.e. CDRs or charging events).

The complete document structure for these TSs is defined in TS 32.240 [2].

The present document specifies the Offline and Online Charging description for the Short Message Service (SMS), based on the functional description in TS 23.040 [7], TS 23.204 [8] for SMS over IP, and TS 23.682 [17] for SMS procedures using T4. The present document does not replace existing offline SMS charging functionality defined for Circuit Switched in TS 32.250 [9] and for Packet Switched in TS 32.251 [10], and therefore is in addition to those specifications. This charging description includes the offline and online charging architecture and scenarios specific to SMS, as well as the mapping of the common 3GPP charging architecture specified in TS 32.240 [2] onto SMS. It further specifies the structure and content of the CDRs for offline charging, and the charging events for online charging. The present document is related to other 3GPP charging TSs as follows:

- The common 3GPP charging architecture is specified in TS 32.240 [2];
- The parameters, abstract syntax and encoding rules for the CDRs are specified in TS 32.298 [3];
- A transaction based mechanism for the transfer of CDRs within the network is specified in TS 32.295 [6];
- The file based mechanism used to transfer the CDRs from the network to the operator's billing domain (e.g. the billing system or a mediation device) is specified in TS 32.297 [5];
- The 3GPP Diameter application that is used for SMS offline and online charging is specified in TS 32.299 [4].
- The services, operations and procedures of charging, using Service Based Interface are specified in TS 32.290 [19].
- The charging service of 5G system is specified in TS 32.291 [20].

Furthermore, requirements that govern the charging work are specified in TS 22.115 [102].

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 32.240: "Telecommunication management; Charging management; Charging architecture and principles".
- [3] 3GPP TS 32.298: "Telecommunication management; Charging management; Charging Data Record (CDR) parameter description".
- [4] 3GPP TS 32.299: "Telecommunication management; Charging management; Diameter charging application".
- [5] 3GPP TS 32.297: "Telecommunication management; Charging management; Charging Data Record (CDR) file format and transfer".
- [6] 3GPP TS 32.295: "Telecommunication management; Charging management; Charging Data Record (CDR) transfer".
- [7] 3GPP TS 23.040: "Technical realization of Short Message Service (SMS)".
- [8] 3GPP TS 23.204: "Support of Short Message Service (SMS) over generic 3GPP Internet Protocol (IP) access; Stage 2".
- [9] 3GPP TS 32.250: "Telecommunication management; Charging management; Circuit Switched (CS) domain charging".
- [10] 3GPP TS 32.251: "Telecommunication management; Charging management; Packet Switched (PS) domain charging".
- [11] 3GPP TS 32.296: "Telecommunication management; Charging management; Online Charging System (OCS) applications and interfaces".
- [12] IETF RFC 4006: "Diameter Credit-Control Application".
- [13] 3GPP TS 32.270: "Telecommunication management; Charging management; Multimedia Messaging Service (MMS) charging".
- [14] 3GPP TS 23.038: "Alphabets and language-specific information".
- [15] 3GPP TS 32.260: "Telecommunication management; Charging management; IP Multimedia Services (IMS) charging".
- [16] 3GPP TS 22.142: "Value Added Services (VAS) for Short Message Service (SMS) requirements".
- [17] 3GPP TS 23.682: "Architecture enhancements to facilitate communications with packet data networks and applications".
- [18] 3GPP TS 29.337: "Diameter-based T4 interface for communications with packet data networks and applications".
- [19] 3GPP TS 32.290: "Telecommunication management; Charging management; 5G system; Services, operations and procedures of charging using Service Based Interface (SBI)".

[20]	3GPP TS 32.291: " Telecommunication management; Charging management 5G system; Charging service, stage 3".
[21]-[99]	Void.
[100]-[199]	Void.
[200]	3GPP TS 29.338: "Diameter based protocols to support Short Message Service (SMS) capable Mobile Management Entities (MMEs)".
[201]	3GPP TS 23.501:"System Architecture for the 5G System".
[202]	3GPP TS 23.502:"Procedures for the 5G System".
[203]	3GPP TS 29.061: "Interworking between the Public Land Mobile Network (PLMN) supporting packet based services and Packet Data Networks (PDN)".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1], TS 32.240 [2] 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] or TS 32.240 [2].

SMS node: An SMS node, in the present document, refers to either an SMS router, IP-SM-GW, SMS-SC, SMSF or a combination of these nodes.

3.2 Symbols

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

Bsm	Reference point for the CDR file transfer from SMS CGF to the BD,
Ga	Reference point for CDR transfer between a CDF and the CGF.
Rf	Offline charging reference point between a 3G network element and the CDF.
Ro	Online charging reference point between a 3G network element and the OCS.T4 Reference point used between MTC-IWF and the SMS-SC in the HPLMN.

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1], TS 32.240 [2] and the following apply:

5GS	5G System
NCGI	NR Cell Global Identity

4 Architecture considerations

4.1 High level SMS architecture

The high level SMS architecture is as defined in TS 23.040 [7]. Only the SMS Router, SMS-SC, IP-SM-GW and the SMSF are within the scope of the present document. The details for the other nodes in the SMS architecture are defined in TS 32.250 [9] and TS 32.251 [10].

4.2 SMS offline charging architecture

The architecture for SMS offline charging is described in figure 4.2.1

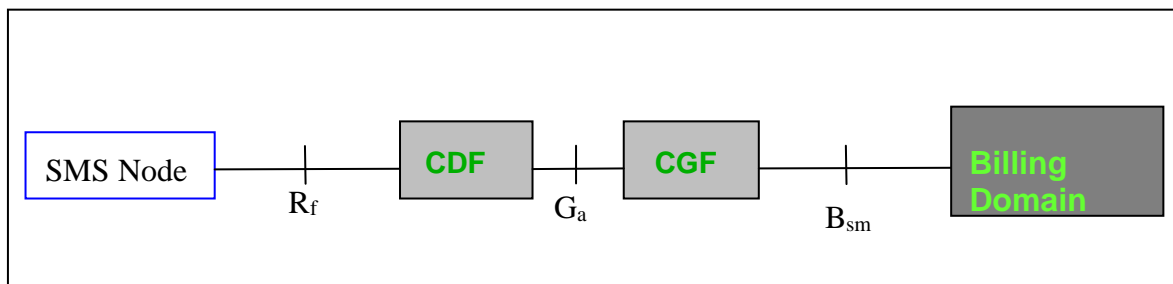


Figure 4.2.1: SMS offline charging architecture

The SMS Nodes for which this architecture applies are the SMS-SC and IP-SM-GW.

Details on the interfaces and functions can be found in TS 32.240 [2] for the general architecture components. The Rf interface is described in clause 6.1.1, Ga in clause 6.1.2, and Bsm in clause 6.1.3 of this document.

4.3 SMS online charging architecture

For online charging, the relevant SMS nodes utilise the Ro interface and application towards the OCS as specified in TS 32.299 [4]. The Ro reference point covers all online charging functionality required for SMS.

The SMS online charging architecture is depicted in figure 4.3.1

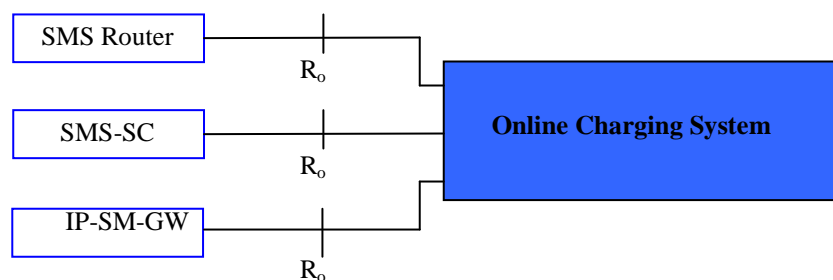


Figure 4.3.1: SMS online charging architecture

Details on the interfaces and functions can be found in TS 32.240 [2] for the general architecture components, TS 32.296 [11] for the OCS, and TS 32.299 [4] for the Ro application.

4.4 SMS converged charging architecture

The architectural options for SMS converged charging are depicted in figure 4.4.1

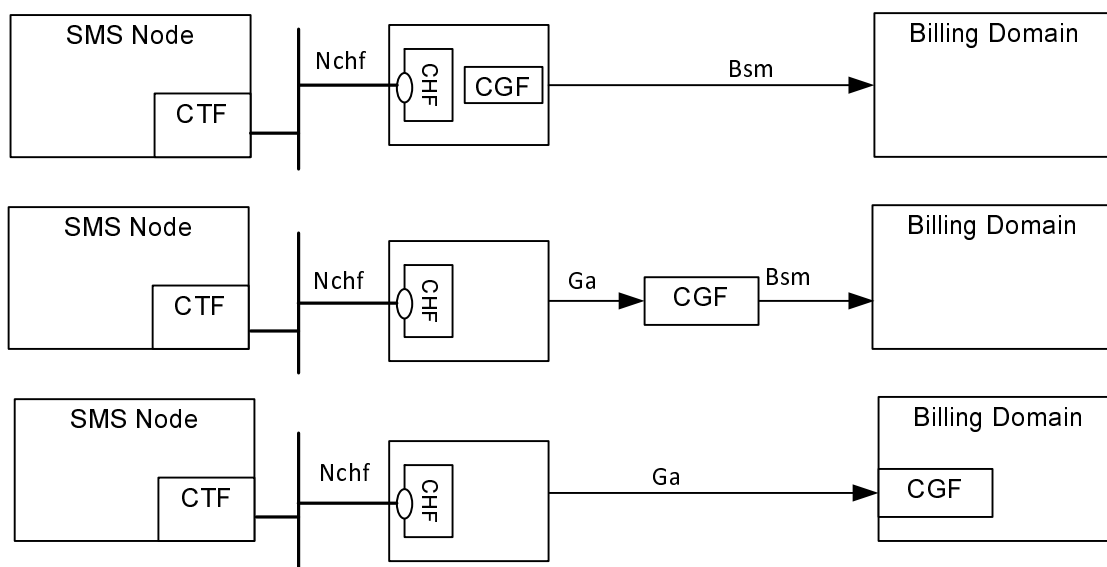


Figure 4.4.1: SMS converged charging architecture

The SMS Node for which this architecture applies is the SMSF.

The general architecture components can be found in TS 32.240 [2].

Ga is described in clause 5.2.4 and Bsm in clause 5.2.5 of this document, and Nchf is described in TS 32.290 [19].

5 SMS charging principles and scenarios

5.1 SMS charging principles

5.1.1 General principles

The Short Message Service (SMS) comprises 5 main operational scenarios:

- **Person to Person:** The message is sent by a UE as originator and received by a UE as destination.
- **Person to Application:** The message is sent by a UE as originator and received by a third party application as destination.
- **Application to Person:** The message is sent by a third party application as originator and received by a UE as destination.
- **Application to Application:** The message is sent by a third party application as originator and received by another third party application as destination.
- **Device Triggering:** the message is sent on behalf of an application as originator and received by a device as destination.
- **MSISDN-less UE to Application via T4:** the message is sent by a MSISDN-less UE as originator and received by a third party application as destination (e.g. SCS/AS) in MSISDN-less MO-SMS via T4 scenario.

In addition SMS nodes may apply services such as Value Added Services (VAS) specified in TS 22.142 [16], services defined in industry standard protocols for SM submission from applications in a fixed network (protocols such as SMPP, UCP/EMI, OIS, CIMD, etc.) or vendor specific services as endorsed by TS 23.040 [7]. As such, the SMS node collects charging information such as:

- the destination and source addresses applied for an SM;
- an indication of origination or termination handling;
- identification of the node(s) and connection(s) involved in the SM transaction;
- SM validity period;
- in scenarios involving an application / VASP, the charging information describes the identification of the application / VASP;
- requested SM service type.

5.1.2 Segmentation and concatenation

Information about concatenated messages should be sent to the charging systems in order to apply the appropriate charging models. The charging system may be required to be stateful to process information about segmented messages.

5.1.3 Triggers for generation of charging information

The following service level events shall, based on operator configuration, trigger the generation of charging information:

- Simple submission, except for device triggering – based on reception at the SMS node.
- Enhanced submission – based on completion of the transaction handling at the SMS node.
- Origination retry – based on the enhanced submission where the initial handling fails and a redelivery attempt is initiated.
- Delivery, except for device triggering – based on delivery from the SMS node.

- Delivery report – reports based on the delivery to Person.
- Termination – Application to Person scenario only.
- Termination retry – Application to Person scenario only – reattempt delivery of an SM to a terminating entity;
- SM Service request.
- SMS via T4 related events specified in clause 5.1.4.

Depending on the charging model applied, a "refund" may be necessary for unsuccessful delivery in online charging.

See clause 5.2 and 5.3 for detailed procedures associated with the triggers above for offline charging and online charging respectively.

5.1.4 SMS via T4

For the following TS 23.682 [17] procedures using T4 interface and relying on SMS capability, online and offline charging functionalities are based on SMS-SC reporting chargeable events associated with the corresponding functionalities:

- Device Triggering Function;
- MSISDN-less MO-SMS via T4.

For Device Triggering functionality, following chargeable events are considered:

- Device Trigger submitted to the SMS-SC from MTC-IWF, for request, replace and recall;
- SMS Delivery from the SMS-SC for Device Triggering towards the UE - based on delivery from the SMS node;
- SMS Delivery from the SMS-SC for Device Triggering towards the UE - based on completion of the transaction handling at the SMS node;

The protocol description for Device Triggering functionality is detailed in TS 29.337 [18].

For MSISDN-less MO-SMS via T4 functionality, allowing MSISDN-less UE to send small data to an SCS/AS (i.e. destination SME) using SMS-MO, the completion of the transaction at the SMS-SC is considered, since SMS-SC store and forward capability for MO-SMS is not used. Instead, the SMS-MO received by the SMS-SC through MO submission TS 23.040 [12]) procedures, is directly forwarded to the MTC-IWF through appropriate protocol for further transfer to the recipient SCS/AS. Also, the SMS-MO delivery answer status from MTC-IWF received by the SMS-SC is directly conveyed back to the UE.

For MSISDN-less MO-SMS via T4 functionality, the chargeable event considered is:

- MO-SMS via T4 submission - based on Delivery response from the MTC-IWF.

The protocol description for MSISDN-less MO-SMS via T4 functionality is detailed in TS 29.338 [200].

5.2 SMS offline charging scenarios

5.2.1 Basic principles

SMS offline charging functionality is based on SMS Nodes reporting chargeable events associated with SM transactions.

The SMS offline charging applies to the SMS-SC and IP-SM-GW.

SMS offline charging uses the Diameter Offline Charging as specified in TS 32.299 [4].

Event based charging applies, with reporting achieved by sending *Charging Data Request* [Event] to the CDF.

SMS transactions are collected independently by the SMS Node , or on completion handling at SMS Node (enhanced submission) .

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