ETSI TS 132 278 V17.0.0 (2022-04)

TECHNICAL SPECIFICATION

**LTE;
Telecommunication management;
Charging management;
Monitoring event charging
(3GPP TS 32.278 version 17.0.0 Release 17)**

Reference

RTS/TSGS-0532278vh00

Keywords

LTE

ETSI

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Contents

Foreword

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

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

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1 Scope

The present document is part of a series of documents that specify charging functionality and charging management in GSM/UMTS/LTE networks. The GSM/UMTS/LTE core network charging architecture and principles are specified in TS 32.240 [1], 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 [1].

The present document specifies the Offline Charging description for Monitoring Events, based on the functional stage 2 description in TS 23.682 [243]. This charging description includes the offline charging architecture and scenarios specific to Monitoring Events, as well as the mapping of the common 3GPP charging architecture specified in TS 32.240 [1] onto the 3GPP Architecture for Service Capability Exposure. It further specifies the structure and content of the CDRs for offline charging. The present document is related to other 3GPP charging TSs as follows:

- The common 3GPP charging architecture is specified in TS 32.240 [1].

- The parameters, abstract syntax and encoding rules for the CDRs are specified in TS 32.298 [51].

- A transaction based mechanism for the transfer of CDRs within the network is specified in TS 32.295 [54].

- 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 [52].

- The 3GPP Diameter application that is used for Monitoring Event offline charging is specified in TS 32.299 [50].

The online charging functionality for Monitoring Events is outside the scope of 3GPP standardisation.

All references, abbreviations, definitions, descriptions, principles and requirements, used in the present document, that are common across 3GPP TSs, are defined in the 3GPP Vocabulary, TR 21.905 [100]. Those that are common across charging management in GSM/UMTS/LTE domains, services or subsystems are provided in the umbrella document TS 32.240 [1] and are copied into clause 3 of the present document for ease of reading. Finally, those items that are specific to the present document are defined exclusively in the present document.

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 TS 32.240: "Telecommunication management; Charging management; Charging architecture and principles".

[2] - [9]   Void.

[10]   3GPP TS 32.250: "Telecommunication management; Charging management; Circuit Switched (CS) domain charging".

[11]   3GPP TS 32.251: "Telecommunication management; Charging management; Packet Switched (PS) domain charging".

[12] - [19]   Void.

[20]   3GPP TS 32.260: "Telecommunication management; Charging management; IP Multimedia Subsystem (IMS) charging".

[21] - [29]   Void.

[30]   3GPP TS 32.270: "Telecommunication management; Charging management; Multimedia Messaging Service (MMS) charging".

[31]   3GPP TS 32.271: "Telecommunication management; Charging management; Location Services (LCS) charging".

[32]   3GPP TS 32.272: "Telecommunication management; Charging management; Push-to-Talk over Cellular (PoC) charging".

[33]   3GPP TS 32.273: "Telecommunication management; Charging management; Multimedia Broadcast/Multicast Service (MBMS) charging".

[34]   3GPP TS 32.274: "Telecommunication management; Charging management; Short Message Service (SMS) charging".

[35]   3GPP TS 32.275: "Telecommunication management; Charging management; MultiMedia Telephony (MMTel) charging".

[36]   3GPP TS 32.276: "Telecommunication management; Charging management; Voice Call Service (VCS) charging".

[37]   3GPP TS 32.277: "Telecommunication management; Charging management; Proximity-based Services (ProSe) charging".

[38] - [49]   Void.

[50]   3GPP TS 32.299: "Telecommunication management; Charging management; Diameter charging application".

[51]   3GPP TS 32.298: "Telecommunication management; Charging management; Charging Data Record (CDR) parameter description".

[52]   3GPP TS 32.297: "Telecommunication management; Charging management; Charging Data Record (CDR) file format and transfer".

[53]   3GPP TS 32.296: "Telecommunication management; Charging management; Online Charging System (OCS) applications and interfaces".

[54]   3GPP TS 32.295: "Telecommunication management; Charging management; Charging Data Record (CDR) transfer".

[55]   Void.

[56]   3GPP TS 32.293: "Telecommunication management; Charging management; Proxy Function".

[57] - [99]   Void.

[100]   3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[101]   3GPP TS 22.101: "Service aspects; Service Principles".

[102]   3GPP TS 22.115: "Service aspects; Charging and billing".

[103]   3GPP TS 23.002: "Network Architecture".

[104]   3GPP TS 23.003: "Numbering, addressing and identification".

[105]   3GPP TS 27.001: "General on Terminal Adaptation Functions (TAF) for Mobile Stations (MS)".

[106] - [199]   Void.

[200] – [212]   void

[213]   3GPP TS 24.002: "GSM - UMTS Public Land Mobile Network (PLMN) access reference configuration".

[214] - [242]   Void.

[243]   3GPP TS 23.682: "Architecture enhancements to facilitate communications with packet data networks and applications".

[244] - [299]   Void.

[300]   Recommendation ITU-T D.93: "Charging and accounting in the international land mobile telephone service (provided via cellular radio systems)".

[301] - [309]   Void.

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

[311] - [329]   Void.

[330]   Recommendation ITU-T Q.767: "Application of the ISDN user part of CCITT signalling System No.7 for international ISDN interconnections".

[331] - [349]   Void.

[350]   Recommendation ITU-T X.25: "Interface between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit".

[351]   Recommendation ITU-T X.121: "International numbering plan for public data networks".

[352] - [399]   Void.

[400]   IETF RFC 959 (1985): "File Transfer Protocol".

[401]   Void.

[402]   IETF RFC 4006 (2005): "Diameter Credit-Control Application".

[403] - [499]   Void.

[500] - [599]   Void.

3   Definitions, symbols and abbreviations

3.1   Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [100] 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 [100].

2G- / 3G-: prefixes 2G- and 3G- refer to functionality that supports only GSM or UMTS, respectively, e.g. 2G-SGSN refers only to the GSM functionality of an SGSN.

NOTE 1: When the term/prefix is omitted, reference is made independently from the GSM or UMTS functionality.

accounting: process of apportioning charges between the Home Environment, Serving Network and Subscriber.

application data: information / data specific to an application other than the MMS User Agent / VASP which is intended to be transported without alteration by using MMS.

>   NOTE 2: Application Data may be of any content type and format.

billing: function whereby CDRs generated by the charging function(s) are transformed into bills requiring payment.

Billing Domain: part of the operator network, which is outside the telecommunication network, that receives and processes CDR files from the core network charging functions.

>   NOTE 3: It includes functions that can provide billing mediation and billing or other (e.g. statistical) end applications. It is only applicable to offline charging (see "Online Charging System" for equivalent functionality in online charging).

CDR field categories: the CDR fields are defined in the present document. CDR fields may be operator provisionable and are divided into the following categories:

-   **Mandatory (M):** field that shall always be present in the CDR.

-   **Conditional (C):** field that shall be present in a CDR if certain conditions are met.

-   **Operator Provisionable: Mandatory (O_M):** field that, if provisioned by the operator, shall always be present in the CDR.

-   **Operator Provisionable: Conditional (O_C):** field that, if provisioned by the operator, shall be present in a CDR if certain conditions are met.

chargeable event: activity utilizing telecommunication network resources and related services for:

-   user to user communication (e.g. a single call, a data communication session or a short message); or

-   user to network communication (e.g. service profile administration); or

-   inter-network communication (e.g. transferring calls, signalling, or short messages); or

-   mobility (e.g. roaming or inter-system handover); and

-   that the network operator may want to charge for.

>   NOTE 4: As a minimum, a chargeable event characterises the resource / service usage and indicates the identity of the involved end user(s).

charged party: user involved in a chargeable event who has to pay parts or the whole charges of the chargeable event, or a third party paying the charges caused by one or all users involved in the chargeable event, or a network operator.

charging: function within the telecommunications network and the associated OCS/BD components whereby information related to a chargeable event is collected, formatted, transferred and evaluated in order to make it possible to determine usage for which the charged party may be billed (offline charging) or the subscriber's account balance may be debited (online charging).

Charging Data Record (CDR): formatted collection of information about one or more chargeable event(s) (e.g. time of call set-up, duration of the call, amount of data transferred, etc) for use in billing and accounting.

>   NOTE 5: For each party to be charged for parts of or all charges of the chargeable event(s) a separate CDR shall be generated, i.e. more than one CDR may be generated for a single chargeable event, e.g. because of its long duration, or because more than one charged party is to be charged.

charging event: set of charging information forwarded by the CTF towards the CDF (offline charging) or towards the OCS (online charging).

>   NOTE 6: Each charging event matches exactly one chargeable event.

charging function: entity inside the core network domain, subsystem or service that is involved in charging for that domain, subsystem or service.

delivery report: feedback information provided to an originator MMS User Agent by an MMS Relay/Server about the status of the delivery of an MM.

domain: part of a communication network that provides network resources using a certain bearer technology.

GSM only: qualifier indicating that this clause or paragraph applies only to a GSM system.

> NOTE 7: For multi-system cases this is determined by the current serving radio access network.

in GSM,...: qualifier indicating that this paragraph applies only to GSM System.

in UMTS,...: qualifier indicating that this paragraph applies only to UMTS System.

inter-system change: change of radio access between different radio access technologies such as GSM, UMTS and LTE.

"middle tier" (charging) TS: term used for the 3GPP charging TSs that specify the domain / subsystem / service specific, online and offline, charging functionality.

> NOTE 8: These are all the TSs in the numbering range from TS 32.250 to TS 32.279, e.g. TS 32.250 [10] for the CS domain, TS 32.260 [20] for the IMS or TS 32.270 [30] for the MMS service. Currently, there is only one "tier 1" TS in 3GPP, which is TS 32.240 [1] that specifies the charging architecture and principles. Finally, there are a number of top tier TSs in the 32.29x numbering range ([50] ff) that specify common charging aspects such as parameter definitions, encoding rules, the common billing domain interface or common charging applications.

offline charging: charging mechanism where charging information **does not** affect, in real-time, the service rendered.

online charging: charging mechanism where charging information **can** affect, in real-time, the service rendered and therefore a direct interaction of the charging mechanism with bearer/session/service control is required.

online charging system: the entity that performs real-time credit control. Its functionality includes transaction handling, rating, online correlation and management of subscriber account balances.

packet switched domain: domain within GSM/UMTS/LTE in which data is transferred in packet switched mode. Corresponds to the term "GPRS".

partial CDR: CDR that provides charging information on part of a subscriber session. A long session may be covered by several partial CDRs.

> NOTE 9: Two formats are considered for Partial CDRs. One that contains all of the provisioned fields (FQPC); the second has a reduced format (RPC).

settlement: payment of amounts resulting from the accounting process.

subscriber: entity (associated with one or more users) that is engaged in a subscription with a service provider.

> NOTE 10: The subscriber is allowed to subscribe and unsubscribe services, to register a user or a list of users authorised to enjoy these services, and also to set the limits relative to the use that associated users make of these services.

successful call: connection that reaches the communication or data transfer phase e.g. the "answered" state for speech connections.

> NOTE 11: All other connection attempts are regarded as unsuccessful.

target UE: UE being positioned.

tariff period: part of one (calendar) day during which a particular tariff is applied. Defined by the time at which the period commences (the switch-over time) and the tariff to be applied after switch-over.

tariff: set of parameters defining the network utilisation charges for the use of a particular bearer / session / service.

UMTS only: qualifier indicating that this clause or paragraph applies only to a UMTS system.

> NOTE 12: For multi-system cases this is determined by the current serving radio access network.

user: entity, not part of the 3GPP System, that uses network resources by means of a subscription.

> NOTE 13: The user may or may not be identical to the subscriber holding that subscription.

User Equipment (UE): device allowing a user access to network services.

NOTE 14: For the purpose of 3GPP specifications the interface between the UE and the network is the radio interface. A User Equipment can be subdivided into a number of domains, the domains being separated by reference points. Currently defined domains are the USIM and ME Domains. The ME Domain can further be subdivided into several components showing the connectivity between multiple functional groups. These groups can be implemented in one or more hardware devices. An example of such a connectivity is the TE – MT interface. Further, an occurrence of a User Equipment is an MS for GSM as defined in TS 24.002 [213].

3.2 Symbols

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

Bmn	Reference point for the CDR file transfer from the Monitoring Event CGF to the BD.
Ga	Reference point for CDR transfer between a CDF and the CGF.
Ns	Reference point between the SCEF and the RCAF.
Rf	Offline charging reference point between a MME/SGSN/IWK-SCEF and the CDF.
S6t	Reference point between the SCEF and the HSS.
T6a	Reference point between the SCEF and the s erving MME.
T6ai	Reference point between the IWK-SCEF and the serving MME.
T6b	Reference point between the SCEF and the serving SGSN.
T6bi	Reference point between the IWK-SCEF and the serving SGSN.
T7	Reference point between the IWK-SCEF and the serving SCEF.

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [100] 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 [100].

3G	3rd Generation
3GPP	3rd Generation Partnership Project
ACA	Accounting Answer
ACR	Accounting Request
AMF	Account Balance Management Function
APN	Access Point Name
AVP	Attribute Value Pair
BD	Billing Domain
BS	Billing System
CCF	Charging Collection Function
CDF	Charging Data Function
CDR	Charging Data Record
CG	Charging Gateway
CGF	Charging Gateway Function
CRF	Charging Rules Function
CTF	Charging Trigger Function
DCCA	Diameter Credit Control Application
EBCF	Event Based Charging Function
ECUR	Event Charging with Unit Reservation
FCI	Furnish Charging Information
FQPC	Fully Qualified Partial CDR
FTAM	File Transfer, Access and Management
G-CDR	GGSN (PDP context) generated - CDR
GGSN	Gateway GPRS Support Node
GPRS	General Packet Radio Service
GSM	Global System for Mobile communication
HLR	Home Location Register
HPLMN	Home PLMN
HSS	Home Subscriber Server

IEC	Immediate Event Charging
IETF	Internet Engineering Task Force
IMEI	International Mobile Equipment Identity
IMSI	International Mobile Subscriber Identity
IP	Internet Protocol
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
ISDN	Integrated Services Digital Network
IWK-SCEF	Interworking SCEF
M-CDR	Mobility management generated - Charging Data Record
MECN	Monitoring Event Charging Node (MME, SGSN, IWK-SCEF)
MNC	Mobile Network Code (part of IMSI)
MSISDN	Mobile Station ISDN number
NE	Network Element
NI	Network Identifier (part of the APN)
OCF	Online Charging Function
OCS	Online Charging System
OMA	Open Mobile Alliance
PLMN	Public Land Mobile Network
PMD	Pseudonym Mediation Device functionality
PS	Packet-Switched
PSPDN	Packet-Switched Public Data Network
PSTN	Public Switched Telephony Network
QoS	Quality of Service
RAB	Radio Access Bearer
RAN	Radio Access Network
RF	Rating Function
SBCF	Session Based Charging Function
SCCP	Signalling Connection Control Part
S-CDR	SGSN (PDP context) generated – CDR
SCEF	Service Capability Exposure Function
SCUR	Session Charging with Unit Reservation
SGSN	Serving GPRS Support Node
TAP	Transferred Account Procedure
TDP	Trigger Detection Point
TPF	Traffic Plane Function
TR	Technical Report
TS	Technical Specification
TV	Type, Value
UA	User Agent
UE	User Equipment
UMTS	Universal Mobile Telecommunications System
UTRAN	Universal Terrestrial Radio Access Network
VLR	Visitor Location Register
VPLMN	Visited PLMN

4 Architecture considerations

4.1 High level monitoring event architecture

Figure 4.1.1 shows the overall architecture for Service Capability Exposure which enables the 3GPP network to securely expose its services and capabilities provided by 3GPP network interfaces to external 3rd party service provider applications, which includes Monitoring Event functionality, as described in TS 23.682 [243].
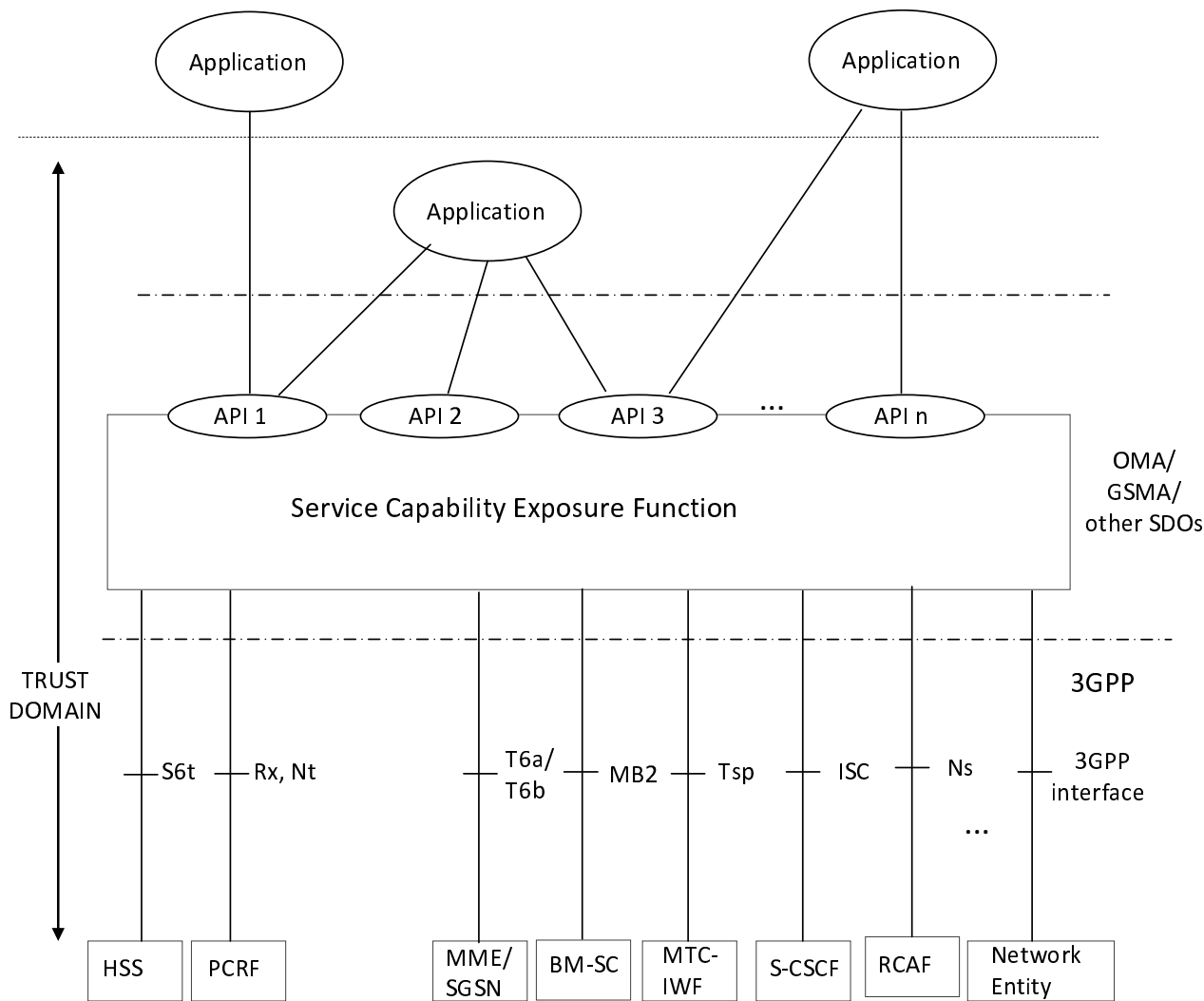
Figure 4.1.1: 3GPP Architecture for Service Capability Exposure

For roaming case, the Interworking SCEF (IWK-SCEF) is optionally deployed and located in the VPLMN, as described in figure 4.1.2.
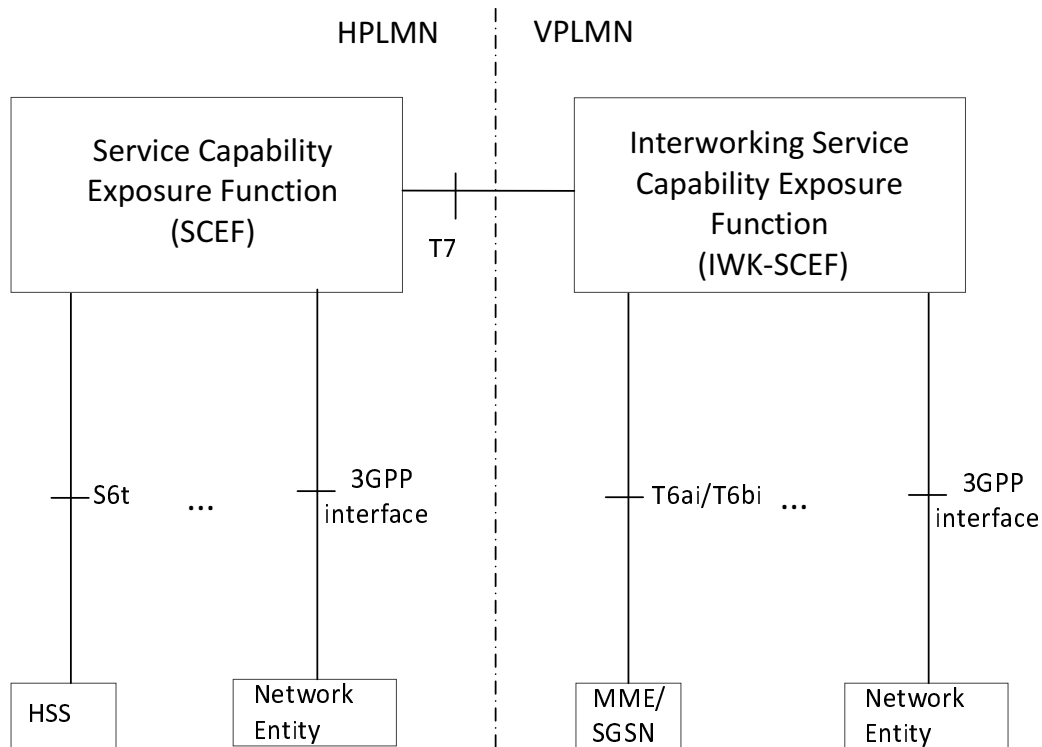
Figure 4.1.2: 3GPP roaming Architecture for Service Capability Exposure

4.2   Monitoring Event offline charging architecture

As described in TS 32.240 [1], the CTF (an integrated component in each charging relevant NE) generates charging events and forwards them to the CDF. The CDF, in turn, generates CDRs which are then transferred to the CGF. Finally, the CGF creates CDR files and forwards them to the BD.

For offline charging the following Monitoring Event Charging Nodes (MECN), functioning as the CTF, may generate accounting metrics sets for Monitoring Event CDRs:

-    the MME, to record Monitoring Events;

-    the SGSN, to record Monitoring Events;

-    the IWK-SCEF, to record Monitoring Events.

If the MECN generating the charging information has an integrated CDF, then the MECN can produce CDRs. The CGF may also be integrated in the MECN, or it may exist as a physically separate entity.
If the CGF is external to the MECN/CDF, then the MECN/CDF forwards the CDRs to the CGF across the Ga interface. In this case, the relationship between MECN/CDF and CGF is m:1.
If the CGF is integrated in the MECN/CDF, then there is only an internal interface between the CDF and the CGF. In this case, the relationship between MECN/CDF and CGF is 1:1. An integrated CGF may support the Ga interface from other MECN/CDFs.

If the CDF is external to the MECN, the charging events are transferred from the MECN to the CDF via the Rf interface specified in TS 32.299 [50]. In this case, the relationship between MECN and CDF is m:1.

When an external CGF is used, this CGF may also be used by other, i.e. non-Monitoring Event, network elements, according to network design and operator decision. It should be noted that the CGF may also be an integrated component of the BD – in this case, the Bmn interface does not exist and is replaced by a proprietary solution internal to the BD.

Figure 4.2.1 depicts the architectural options described above.
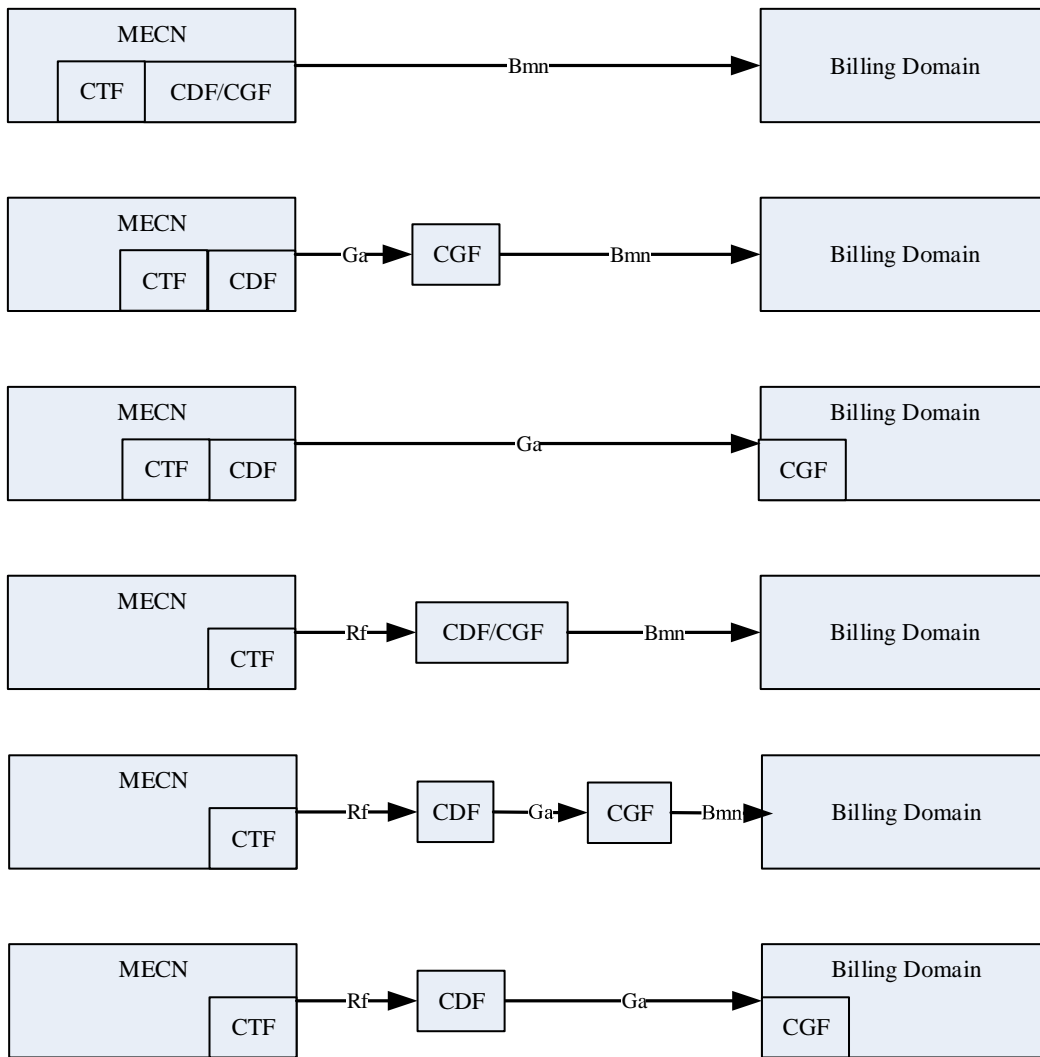
Figure 4.2.1: Monitoring Event offline charging architecture

It is mandatory to support at least one of the Rf, Ga or Bmn interfaces from the MECN as described in the present document.

NOTE: Support of Monitoring Event charging is optional for MECN.

4.3   Monitoring Event online charging architecture

Not specified in the present document.

5 Monitoring event charging principles and scenarios

5.1 Monitoring event charging principles

Two types of activities associated with Monitoring Events as specified in TS 23.682 [243] are:

- Monitoring Event configuration request

- Monitoring Event report

The following are high level charging requirements for Monitoring Events, derived from requirements in TS 23.682 [243]:

- MECN shall be able, based on operator configuration, to collect charging information for Monitoring Event configuration requests from HSS or SCEF in the same PLMN using offline charging.

- MECN shall be able, based on operator configuration, to collect charging information for Monitoring Event configuration requests from HSS or SCEF in a different PLMN using offline charging.

- MECN shall be able, based on operator configuration, to collect charging information for Monitoring Event reports toward SCEF in the same PLMN using offline charging.

- MECN shall be able, based on operator configuration, to collect charging information for Monitoring Event reports towards SCEF in a different PLMN using offline charging.

For Monitoring Event configuration requests, the MECN shall collect the following information:

- time configuration request received;

- configuration activity: create, transfer, update, delete;

- identity of the SCEF originating request and the reference identifier used by the SCEF for the request;

- type of event to be monitored;

- maximum number of reports to be generated for the event type;

- time at which the request is considered to expire;

- identity of the chargeable party for the request, when provided to the MECN.

For Monitoring Event configuration requests, the MECN shall collect the following information, if applicable for the type of event:

- identity of the monitored user;

- maximum period of time without any communication with the UE;

- reachability type, e.g. SMS or data;

- maximum delay acceptable for downlink data transfers;

- time for which the UE stays reachable to allow the SCS/AS to reliable deliver the required downlink data;

- number of packets that the Serving Gateway shall buffer in case the UE is not reachable;

- whether the request is for current location or last known location;

- desired level of accuracy of the requested location information;

- list of cells, eNodeB's and/or RAI(s)/TAI(s) for determination of the number of UEs in the area;

- whether the request was successful or not.

For Monitoring Event reports, the MECN shall collect the following information:

- identity of the SCEF originating request and the reference identifier used by the SCEF for the request;

- type of event reported;

- number of the event report for the specific configured request in the MECN;

- identity of the chargeable party for the request, when provided to the MECN.

For Monitoring Event reports, the MECN shall collect the following information, if applicable for the type of event:

- identity of the monitored user;

- reachability status of the user;

- reported location of the user;

- RAN or NAS cause code for communication failure with the UE;

- an indication whether an error occurred in the report.

5.2 Monitoring event offline charging scenarios

5.2.1 Basic principles

If charging is supported by an SGSN, MME, or IWK-SCEF, known as a MECN, it shall be able to report charging events for CDRs generated by the CDF.

The following chargeable events are defined for Monitoring Event configuration requests:

- Monitoring Event configuration request received from HSS or SCEF.

- Monitoring Event configuration request transferred from another MECN.

- Monitoring Event configuration request update received from HSS or SCEF.

- Monitoring Event configuration request deletion received from HSS or SCEF.

The following chargeable events are defined for Monitoring Event reports:

- Monitoring Event report sent, including standalone report request or immediate reporting in the configuration answer messages.

5.2.2 Rf message flows

When a charging event is reported to the CDF, it includes details about the configured Monitoring Event including the identity of the SCEF originating the request and the reference identifier used by the SCEF for the request; type of Monitoring Event; and identity of the chargeable party, if available. Additional information is included based on whether the charging event is for a configuration request or a report and on the specific type of Monitoring Event.

The trigger conditions described in Table 5.2.2.1 are applicable for charging information collection for Monitoring Event charging. Charging Data Request[Event] is sent upon occurrence of the specified event.

In order to save MECN processing effort, a burst of Monitoring Event reports in a short time interval may be treated as a single charging event for reporting to the CDF. The determination of whether to send Charging Data Request[Event] for a single Monitoring Event report sent or for a burst of Monitoring Event reports sent is implementation-specific.

Table 5.2.2.1: Charging Data Request messages triggered for Monitoring Event charging

Message	Triggering conditions
Charging Data Request[Event]	Receipt of Monitoring Event configuration request (new request, update, delete). Transfer of Monitoring Event configuration request. Single Monitoring Event report sent. Burst of Monitoring Event reports sent.

5.2.3 CDR generation

A Monitoring Event Configuration Request CDR (ME-CO-CDR) is meant to collect charging information related to an individual Monitoring Event configuration request in the MECN. A single CDR is generated for each event.

A Monitoring Event Report CDR (ME-RE-CDR) is meant to collect charging information related to a single Monitoring Event report or a burst of Monitoring Event reports in a short time interval. The CDF, may, based on operator implementation, generate a single ME-RE-CDR when a burst of Monitoring Event reports is reported by the CTF or may generate an individual ME-RE-CDR for each Monitoring Event report when a burst is reported by the CTF.

5.2.4 Ga record transfer flows

Details of the Ga protocol application are specified in TS 32.295 [54].

5.2.5 Bmn CDR file transfer

Details of the Bx protocol application are specified in TS 32.297 [52].

5.3 Monitoring event online charging scenarios

5.3.1 Basic principles

Not specified in the present document.

5.3.2 Ro message flows

Not specified in the present document.

6 Definition of charging information

6.1 Data description for monitoring event offline charging

6.1.1 Rf message contents

6.1.1.1 General

The Monitoring Event Offline Charging uses the Charging Data Transfer messages Charging Data Request and Charging Data Response defined in TS 32.299 [50].

The Charging Data Request can be of type event and includes all charging information. The Charging Data Response is an acknowledgement of the Charging Data Request.

Table 6.1.1.1.1 describes the use of these messages for offline charging.

Table 6.1.1.1.1: Offline charging messages reference table

Message	Source	Destination
Charging Data Request	MECN	CDF
Charging Data Response	CDF	MECN

This clause describes the different fields used in the Charging Data messages and the category in the tables is used according to the charging data configuration defined in clause 5.4 of TS 32.240 [1].

6.1.1.2 Charging data request message

Table 6.1.1.2.1 illustrates the basic structure of a Charging Data Request message from the MECN as used for Monitoring Event offline charging.

Table 6.1.1.2.1: Charging Data Request message contents

Information Element	Category	Description
Session Identifier	M	Described in TS 32.299 [50]
Originator Host	M	Described in TS 32.299 [50]
Originator Domain	M	Described in TS 32.299 [50]
Destination Domain	M	Described in TS 32.299 [50]
Operation Type	M	Described in TS 32.299 [50]
Operation Number	M	Described in TS 32.299 [50]
Operation Identifier	O_C	Described in TS 32.299 [50]
User Name	O_C	Described in TS 32.299 [50]
Destination Host	O_C	Described in TS 32.299 [50]
Operation Interval	O_C	Described in TS 32.299 [50]
Origination State	O_C	Described in TS 32.299 [50]
Origination Timestamp	O_C	Described in TS 32.299 [50]
Proxy Information	O_C	Described in TS 32.299 [50]
Route Information	O_C	Described in TS 32.299 [50]
Operation Token	O_M	This field identifies the Monitoring Event Services.
Service Information	O_M	This field holds the Monitoring Event specific information described in clause 6.3.

NOTE: Detailed descriptions of the information elements are provided in TS 32.299 [50].

6.1.1.3 Charging data response message

Table 6.1.1.3.1 illustrates the basic structure of a Charging Data Response message as used for the MECN.

Table 6.1.1.3.1: Charging Data Response message contents

Information Element	Category	Description
Session Identifier	M	Described in TS 32.299 [50]
Operation Result	M	Described in TS 32.299 [50]
Originator Host	M	Described in TS 32.299 [50]
Originator Domain	M	Described in TS 32.299 [50]
Operation Type	M	Described in TS 32.299 [50]
Operation Number	O_C	Described in TS 32.299 [50]
Operation Identifier	O_C	Described in TS 32.299 [50]
Operation Interval	O_C	Described in TS 32.299 [50]
Error Reporting Host	O_C	Described in TS 32.299 [50]
Origination State	O_C	Described in TS 32.299 [50]
Origination Timestamp	O_C	Described in TS 32.299 [50]
Proxy Information	O_C	Described in TS 32.299 [50]

NOTE: Detailed descriptions of the information elements are provided in TS 32.299 [50].

6.1.2 Ga message contents

Refer to clause 5.2.4 for further information.

6.1.3 CDR description on the B_{mn} interface

6.1.3.1 General

The following standard CDR content and formats are considered:

- ME-CO-CDR generated for a single Monitoring Event configuration request.

- ME-RE-CDR generated for a set of Monitoring Event reports.

For each of the CDR types, a parameter table, which gives a short description of the parameters, is provided. The category in the tables are used according to the charging data configuration defined in clause 5.4 of TS 32.240 [1].

6.1.3.2 Monitoring Event Configuration Request charging data (ME-CO-CDR)

If enabled, a Monitoring Event Configuration Request record shall be produced for each monitoring configuration request received. Renewal requests are captured in a separate record from the original request. The fields in the record are specified in table 6.1.3.2.1.

Table 6.1.3.2.1: Monitoring Event Configuration Request charging data (ME-CO-CDR)

Field	Category	Description
Record Type	M	Monitoring Event Configuration Request
Retransmission	O_C	This parameter, when present, indicates that information from retransmitted Accounting Requests has been used in this CDR.
Record Opening Time	O_C	A time stamp reflecting the time the CDF opened this record.
Local Record Sequence Number	O_M	Consecutive record number created by this node. The number is allocated sequentially including all CDR types
Service Context Id	O_M	This parameter indicates the CDR is applicable to Monitoring Event service.
Node Id	O_M	Name of the recording entity.
Local Record Sequence Number	O_M	Consecutive record number created by this node. The number is allocated sequentially including all CDR types.
Record Time Stamp	O_M	This parameter indicates the date and time when the CDR was produced.
Event Timestamp	O_M	This parameter contains the timestamp of the event that triggered the generation of charging information for the Monitoring Event configuration request.
Monitoring Event Configuration Activity	M	This parameter indicates the configuration action requested: create, transfer, update, and delete.
SCEF Reference ID	M	This parameter, created by the SCEF, to identify a Monitoring Request. When combined with the SCEF Id, serves a globally unique identifier for the Monitoring Request.
SCEF Id	M	This parameter indicates the SCEF to which the Monitoring Indication message has to be sent.
Monitoring Type	M	This parameter identifies the specific Monitoring Event being requested.
Maximum Number of Reports	O_C	This parameter, when present, indicates the maximum number of event reports to be generated until the associated Monitoring Event is considered to expire. A value of one implies a single event report is to be generated which makes it equivalent to a One-time Monitoring Request. This parameter is not applicable to the "Availability after DDN Failure" Monitoring Event type.
Monitoring Duration	O_C	This parameter, when present, indicates the absolute time at which the related Monitoring Event request is considered to expire.
Chargeable Party Identifier	O_C	This parameter, when present, identifies the entity towards which accounting/charging functionality is performed by the involved 3GPP network elements.
Monitored User	O_C	This parameter identifies the user that is monitored and is applicable to the "Loss of connectivity", "UE reachability", "Location Reporting", "Communication Failure" and "Availability after DDN Failure" Monitoring Event types.
Maximum Detection Time	O_C	This parameter, when present, indicates the maximum period of time without any communication with the UE after which the SCEF is to be informed that the UE is considered to be unreachable and is applicable to the "Loss of connectivity" Monitoring Event type. The value is on the order of 1 minute to multiple hours.
Reachability Configuration	O_C	This parameter contains the details for configuration for UE reachability and is applicable to the "UE reachability" Monitoring Event type, which includes "Reachability Type", "Maximum Latency" and "Maximum Response Time".
Location Type	O_C	This parameter indicates whether the request is for Current Location or Last Known Location and is applicable to the "Location Reporting" and "Number of UEs present in a geographic area" Monitoring Event type.
Accuracy	O_C	This parameter indicates desired level of accuracy of the requested location information and is applicable to the "Location Reporting" Monitoring Event type. Accuracy could be at cell level (CGI/ECGI), eNB, TA/RA level.
List of Locations	O_C	This parameter identifies the list of cells, eNBs and/or RAI(s)/TAI(s) for determination of the number of UEs in the area and is applicable to the "Number of UEs present in a geographic area" Monitoring Event type.
Monitoring Event Config Status	M	This parameter identifies whether the request was successful or not.
Record Extensions	O_C	A set of network operator/manufacturer specific extensions to the record. Conditioned upon the existence of an extension.

6.1.3.3 Monitoring Event Report charging data (ME-RE-CDR)

If enabled, a Monitoring Event Report record shall be produced for a set of Monitoring Event reports sent. In the normal case, only one Monitoring Event report will be included in the CDR. During times when a burst of Monitoring Event reports are sent, multiple event reports can be captured in the CDR. The fields in the record are specified in table 6.1.3.3.1.

Table 6.1.3.3.1: Monitoring Event Report charging data (ME-RE-CDR)

Field	Category	Description
Record Type	M	Monitoring Event Report
Retransmission	O_C	This parameter, when present, indicates that information from retransmitted Accounting Requests has been used in this CDR.
Record Opening Time	O_C	A time stamp reflecting the time the CDF opened this record.
Local Record Sequence Number	O_M	Consecutive record number created by this node. The number is allocated sequentially including all CDR types
Service Context Id	O_M	This parameter indicates the CDR is applicable to Monitoring Event service.
Node Id	O_M	Name of the recording entity.
Local Record Sequence Number	O_M	Consecutive record number created by this node. The number is allocated sequentially including all CDR types.
Record Time Stamp	O_M	This parameter indicates the date and time when the CDR was produced.
List of Monitoring Event Report Data	O_M	This parameter contains the charging information associated with a set of Monitoring Event reports. The fields for each report are specified in table 6.1.3.3.2.
Record Extensions	O_C	A set of network operator/manufacturer specific extensions to the record. Conditioned upon the existence of an extension.

Table 6.1.3.3.2: Individual Monitoring Event Report charging data within List of Monitoring Event Report Data

Field	Category	Description
Event Timestamp	O_M	This parameter contains the timestamp of the event that triggered the generation of charging information for the Monitoring Event report.
SCEF Reference ID	M	This parameter, created by the SCEF, to identify a Monitoring Request. When combined with the SCEF Id, serves a globally unique identifier for the Monitoring Request.
SCEF Id	M	This parameter indicates the SCEF to which the Monitoring Indication message has to be sent.
Monitoring Event Report Number	M	This parameter indicates the number of the report being sent for the specific request from this MECN. The number is monotonically increasing for each report starting at 1 for each unique request.
Chargeable Party Identifier	O_C	This parameter, when present, identifies the entity towards which accounting/charging functionality is performed by the involved 3GPP network elements.
Monitored User	O_C	This parameter identifies the user that is monitored and is applicable to the "Loss of connectivity", "UE reachability", "Location Reporting", "Communication Failure" and "Availability after DDN Failure" monitoring event types.
Monitoring Type	O_C	This parameter identifies the specific Monitoring Event being reporting.
Reachability Information	O_C	This parameter identifies the reachability status of the UE and is applicable to the "UE reachability" Monitoring Event type.
Reported Location	O_C	This parameter indicates the reported 3GPP system specific location information and is applicable to the "Location Reporting" Monitoring Event type.
Communication Failure Information	O_C	This parameter indicates the reported the reason for communication failure and is applicable to the "Communication Failure" Monitoring Event type.
List of Number Of UEs Per Location Reports	O_C	This parameter contains a list of the location information along with the number of UEs found at each location by the MME/SGSN. It's applicable to the "the number of UEs at a given geographic location" Monitoring Event type.

6.2 Data description for monitoring event online charging

6.2.1 Ro message contents

Not specified in this document.

6.2.2 Monitoring event specific application information

Not specified in this document.

6.3 Monitoring event charging specific parameters

6.3.1 Definition of monitoring event charging information

6.3.1.1 Monitoring event charging information assignment for service information

The components in the Service Information that are used for Monitoring Event charging can be found in table 6.3.1.1.1.

Table 6.3.1.1.1: Service Information used for monitoring event charging

Information Element	Category	Description
Service Information	O$_M$	This is a structured field and holds the 3GPP specific parameter as defined in TS 32.299 [50].
Subscriber Identifier	O$_C$	This field contains the identification of the monitored user (e.g. IMSI) if offline charging applies. It is not applicable for the "Number of UEs present in a geographic area" event.
PS Information	O$_C$	This is a structured IE and hold PS specification parameters. The complete structure is defined in TS 32.251 [11].
Node Id	O$_C$	This IE holds the name of the Node.
Monitoring Event Information	O$_M$	This is a structured field and holds the Monitoring Event specific parameters. The details are defined in clause 6.3.1.2.

6.3.1.2 Definition of the monitoring event information

Monitoring Event specific charging information is provided within the Monitoring Event Information. The fields of the Monitoring Event Information are indicated with the node (MME, SGSN, IWK-SCEF) from which the information is sent.

The detailed structure of the Monitoring Event Information can be found in table 6.3.1.2.1.

Table 6.3.1.2.1: Structure of the monitoring event information

Information Element	Category	Description
Monitoring Event functionality	M	This IE holds the Monitoring Event functionality is used, i.e. monitoring event configuration, monitoring event reporting.
Event Timestamp	O_C	This parameter contains the timestamp of the event that triggered the generation of charging information.
Monitoring Event Configuration Activity	O_C	This parameter indicates the configuration action requested: create, transfer, update, and delete.
SCEF Reference ID	O_C	This parameter, created by the SCEF, to identify a Monitoring Request. When combined with the SCEF Id, serves a globally unique identifier for the Monitoring Request.
SCEF Id	O_C	This parameter indicates the SCEF to which the Monitoring Indication message has to be sent.
Monitoring Type	O_C	This parameter identifies the specific Monitoring Event being requested.
Maximum Number of Reports	O_C	This parameter, when present, indicates the maximum number of event reports to be generated until the associated Monitoring Event is considered to expire. A value of one implies a single event report is to be generated which makes it equivalent to a One-time Monitoring Request. This parameter is not applicable to the "Availability after DDN Failure" Monitoring Event type.
Monitoring Duration	O_C	This parameter, when present, indicates the absolute time at which the related Monitoring Event request is considered to expire.
Chargeable Party Identifier	O_C	This parameter, when present, identifies the entity towards which accounting/charging functionality is performed by the involved 3GPP network elements.
Maximum Detection Time	O_C	This parameter, when present, indicates the maximum period of time without any communication with the UE after which the SCEF is to be informed that the UE is considered to be unreachable and is applicable to the "Loss of connectivity" Monitoring Event type. The value is on the order of 1 minute to multiple hours.
Reachability Configuration	O_C	This parameter contains the details for configuration for UE reachability and and is applicable to the "UE reachability" Monitoring Event type, which includes "Reachability Type", "Maximum Latency" and "Maximum Response Time"..
Location Type	O_C	This parameter indicates whether the request is for Current Location or Last Known Location and is applicable to the "Location Reporting" and "Number of UEs present in a geographic area" Monitoring Event type.
Accuracy	O_C	This parameter indicates desired level of accuracy of the requested location information and is applicable to the "Location Reporting" Monitoring Event type. Accuracy could be at cell level (CGI/ECGI), eNB, TA/RA level.
Location information	O_C	This parameter identifiesan individual location, e.g. cells, eNBs and/or RAI(s)/TAI(s) for determination of the number of UEs in the area and is applicable to the "Number of UEs present in a geographic area" Monitoring Event type. It will be repeated for each location for which the number of UEs is requested.
Monitoring Event Config Status	O_C	This parameter identifies whether the request was successful or not. When the request is not success, a specific value is chosen to indicate the error occurred during handling of the Requested action for the Monitoring event.
Monitoring Event Report Data	O_c	This parameter contains the charging information associated with a Monitoring Event report. It shall be repeated for each report to be captured in the CDR.
Event Timestamp	O_M	This parameter contains the timestamp of the event that triggered the generation of charging information for the Monitoring Event report.
SCEF Reference ID	M	This parameter, created by the SCEF, to identify a Monitoring Request. When combined with the SCEF Id, serves a globally unique identifier for the Monitoring Request.
SCEF Id	M	This parameter indicates the SCEF to which the Monitoring Indication message has to be sent.
Monitoring Event Report Number	M	This parameter indicates the number of the report being sent for the specific request from this MECN. The number is monotonically increasing for each report starting at 1 for each unique request.

Chargeable Party Identifier	O_C	This parameter, when present, identifies the entity towards which accounting/charging functionality is performed by the involved 3GPP network elements.
Monitored User	O_C	This parameter identifies the user that is monitored and is applicable to the "Loss of connectivity", "UE reachability", "Location Reporting", "Communication Failure" and "Availability after DDN Failure" monitoring event types.
Monitoring Type	O_C	This parameter identifies the specific Monitoring Event being reporting.
Reachability Information	O_C	This parameter identifies the reachability status of the UE and is applicable to the "UE reachability" Monitoring Event type.
Reported Location	O_C	This parameter indicates the reported 3GPP system specific location information and is applicable to the "Location Reporting" Monitoring Event type.
Communication Failure Information	O_C	This parameter indicates the reported the reason for communication failure and is applicable to the "Communication Failure" Monitoring Event type.
Number Of UEs Per Location Report	O_C	This parameter contains the location information along with the number of UEs found at that location by the MME/SGSN. It's applicable to the "the number of UEs at a given geographic location" Monitoring Event type. It shall be repeated for each location for which the number of UEs is reported.

6.3.2   Formal monitoring event charging parameter description

6.3.2.1   Monitoring event CDR parameters

The detailed definitions, abstract syntax and encoding of the Monitoring Event CDR parameters are specified in TS 32.298 [51].

6.3.2.2   Monitoring event AVPs

The detailed definitions of Monitoring Event AVPs are specified in TS 32.299 [50].

6.3.3   Detailed message format for offline charging

The following clause specifies per Operation Type the charging data that are sent by MECN for different functionality, i.e. Monitoring Event configuration and Monitoring Event reporting.

The Operation Types are listed in the following order: S (Start)/I (Interim)/S (Stop)/E (Event). Therefore, when all Operation Types are possible it is marked as SISE. If only some Operation Types are allowed for a node, only the appropriate letters are used (i.e. SIS or E) as indicated in the table heading. The omission of an Operation Type for a particular field is marked with "-" (i.e. SI-E). Also, when an entire field is not allowed in a node the entire cell is marked as "-".

Table 6.3.3.1 illustrates the basic structure of the supported fields in the *Charging Data* Request message for Monitoring Event offline charging.

Table 6.3.3.1: Supported fields in *Charging Data Request* message

Information Element	Service Type	Monitoring Event Configuration	Monitoring Event Reporting
	Supported Operation Types	**S/I/S/E**	**S/I/S/E**
Session Identifier		---E	---E
Originator Host		---E	---E
Originator Domain		---E	---E
Destination Domain		---E	---E
Operation Type		---E	---E
Operation Number		---E	---E
Operation Identifier		---E	---E
User Name		---E	---E
Destination Host		---E	---E
Operation Interval		---E	---E
Origination State		---E	---E
Origination Timestamp		---E	---E
Proxy Information		---E	---E
Route Information		---E	---E
Operation Token		---E	---E
Subscriber Identifier		---E	---E
Node Id		---E	---E
Monitoring Event Functionality		---E	---E
Event Timestamp		---E	---E
Monitoring Event Configuration Activity		---E	
SCEF Reference ID		---E	---E
SCEF Id		---E	---E
Monitoring Type		---E	---E
Maximum Number of Reports		---E	-
Monitoring Duration		---E	-
Chargeable Party Identifier		---E	-
Maximum Detection Time		---E	-
Reachability Configuration		---E	-
Location Type		---E	-
Accuracy		---E	-
Location information		---E	-
Monitoring Event Config Status		---E	-
Monitoring Event Report Data		-	---E
Monitoring Event Report Number		-	---E
Monitored User		-	---E
Reachability Information		-	---E
Reported Location		-	---E
Communication Failure Information		-	---E
Number Of UEs Per Location Report		-	---E

Table 6.3.3.2 illustrates the basic structure of the supported fields in the *Charging Data* Responsemessage for Monitoring Event offline charging.

Table 6.3.3.2: Supported fields in *Charging Data* Response message

Information Element	Service Type	Monitoring Event Configuration	Monitoring Event Reporting
	Supported Operation Types	S/I/S/E	S/I/S/E
Session Identifier		---E	---E
Operation Result		---E	---E
Originator Host		---E	---E
Originator Domain		---E	---E
Operation Type		---E	---E
Operation Number		---E	---E
Operation Identifier		---E	---E
Operation Interval		---E	---E
Error Reporting Host		---E	---E
Origination State		---E	---E
Origination Timestamp		---E	---E
Proxy Information		---E	---E
Route Information		---E	---E

6.3.4 Detailed message format for online charging

Not specified in this document.

6.4 Bindings for monitoring event offline charging

This clause aims to describe the mapping between the Diameter Accounting AVPs, IEs and CDR parameters for Monitoring Event offline charging.

Table 6.4.1 describes the mapping of the Diameter Accounting AVPs, IEs, and CDR parameters of ME-CO-CDR and ME-RE-CDR in Monitoring Event offline charging.

Table 6.4.1: Bindings of CDR Parameters, Information Elements and AVPs

CDR Parameter	Information Element	AVP
Record Opening Time	-	-
Local Record Sequence Number	-	-
Service Context Id	Service Context Id	Service-Context-Id
	Service Information	**Service-Information**
Monitored User	Subscriber Identifier	Subscription-Id
	Monitoring Event Information	**Monitoring-Event-Information**
Record Type	Monitoring Event Functionality	Monitoring-Event-Functionality
Event Timestamp	Event Timestamp	Event-Timestamp
Monitoring Event Configuration Activity	Monitoring Event Configuration Activity	Monitoring-Event-Configuration-Activity
SCEF Reference ID	SCEF Reference ID	SCEF-Reference-ID
SCEF Id	SCEF Id	SCEF-ID
Monitoring Type	Monitoring Type	Monitoring-Type
Maximum Number of Reports	Maximum Number of Reports	Maximum-Number-of-Reports
Monitoring Duration	Monitoring Duration	Monitoring-Duration
Chargeable Party Identifier	Chargeable Party Identifier	Charged-Party
Maximum Detection Time	Maximum Detection Time	Maximum-Detection-Time
Reachability Configuration	Reachability Configuration	UE-Reachability-Configuration
Location Type	Location Type	MONTE-Location-Type
Accuracy	Accuracy	Accuracy
List of Locations	Location information	Number-Of-UE-Per-Location-Configuration
Monitoring Event Config Status	Monitoring Event Config Status	Monitoring-Event-Config-Status
List of Monitoring Event Report Data	Monitoring Event Report Data	Monitoring-Event-Report-Data
Event Timestamp	Event Timestamp	Event-Timestamp
SCEF Reference ID	SCEF Reference ID	SCEF-Reference-ID
SCEF Id	SCEF Id	SCEF-ID
Monitoring Event Report Number	Monitoring Event Report Number	Monitoring-Event-Report-Number
Chargeable Party Identifier	Chargeable Party Identifier	Charged-Party
Monitored User	Monitored User	Subscription-Id
Monitoring Type	Monitoring Type	Monitoring-Type
Reachability Information	Reachability Information	Reachability-Information
Reported Location	Reported Location	EPS-Location-information
Communication Failure Information	Communication Failure Information	Communication-Failure-Information
List of Number Of UEs Per Location Report	Number Of UEs Per Location Report	Number-Of-UE-Per-Location-Report
	PS Information	**PS-Information**
Node Id	Node Id	Node-ID

Annex A (informative):
Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
Oct 2015			--	--	S5-155265:TS 32.278 v0.0.0 MONTE charging skeleton S5-155266:Rel-13 pCR 32.278 General Sections for Monitoring Event Charging S5-155267:Rel-13 pCR 32.278 High level Monitoring Event architecture S5-155268:Rel-13 pCR 32.278 Monitoring Event offline charging and online charging architecture S5-155269:Monitoring Event Recording		0.1.0
Nov 2015			--	--	S5-156194: changes for EditHelp S5-156051: Corrections for Monitoring Event charging S5-156294: Charging principles for Monitoring Event charging S5-156195: Rf, Ga, Ro message content of Monitoring Event charging	0.1.0	0.2.0
Dec 2015	SA#70	SP-150685			Presented for information	0.2.0	1.0.0
Jan 2016			--	--	S5-161258: CDR parameters alignment S5-161259: charging information definition and bindings	1.0.0	1.1.0
Feb 2016	SA#71	SP-160024			Minor MCC editorial corrections and presentation for approval.	1.1.0	2.0.0
Mar 2016					Upgrade to change control version	2.0.0	13.0.0

Change history							
Date	**Meeting**	**TDoc**	**CR**	**Rev**	**Cat**	**Subject/Comment**	**New version**
2017-03	SA#75	SP-170138	0003	1	C	Remove reference to RFC 3588	14.0.0
2018-06	-	-	-	-	-	Update to Rel-15 version (MCC)	**15.0.0**
2020-07	-	-	-	-	-	Update to Rel-16 version (MCC)	**16.0.0**
2022-03	-	-	-	-	-	Update to Rel-17 version (MCC)	**17.0.0**

History

Document history		
V17.0.0	April 2022	Publication