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(3GPP TS 32.254 version 15.0.0 Release 15)**



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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 - NAF 742 C
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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 and online charging description for Northbound Application Program Interfaces (API), based on the functional stage 2 description in TS 23.682 [243] for transaction over T8 reference point between SCEF and SCS/AS. This charging description includes the offline and online charging architecture and scenarios specific to Northbound Application Program Interfaces (API), as well as the mapping of the common 3GPP charging architecture specified in TS 32.240 [1] onto the Northbound Application Program Interfaces (API). 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 Northbound Application Program Interfaces (API) offline and online charging is specified in TS 32.299 [50].

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.
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[1] 3GPP TS 32.240: "Telecommunication management; Charging management; Charging architecture and principles".

[2] – [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] – [99]	Void.
[100]	3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
[101] – [199]	Void
[200] – [229]	Void
[230]	3GPP TS 29.122: "T8 reference point for northbound Application Programming Interfaces (APIs)".
[231] – [242]	Void
[243]	3GPP TS 23.682: "Architecture enhancements to facilitate communications with packet data networks and applications".
[244] – [299]	Void
[300] – [399]	Void.

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [100], TS 32.240 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in either 3GPP TR 21.905 [100] or TS 32.240 [1].

3.2 Symbols

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

Bea	Reference point for the CDR file transfer from the Exposure function API CGF to the BD.
Ga	Reference point for CDR transfer between a CDF and the CGF.
Rf	Offline charging reference point between a SCEF and the CDF.
Ro	Online charging reference point between a SCEF and the CDF.
T8	Reference point between the SCEF and SCS/AS.

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP 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 3GPP TR 21.905 [100].

AS	Application Server
BD	Billing Domain
CDF	Charging Data Function
CGF	Charging Gateway Function
CTF	Charging Trigger Function
IE	Information Element
SCEF	Service Capability Exposure Function
SCS	Services Capability Server
SGSN	Serving GPRS Support Node
RCAF	RAN Congestion Awareness Function

4 Architecture considerations

4.1 High-level Service Exposure Function architecture

The overall architecture and detailed description 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 are defined in 3GPP TS 23.682 [243], and figure 4.1.1 is highlighting T8 involved for interworking between SCEF and SCS/AS.

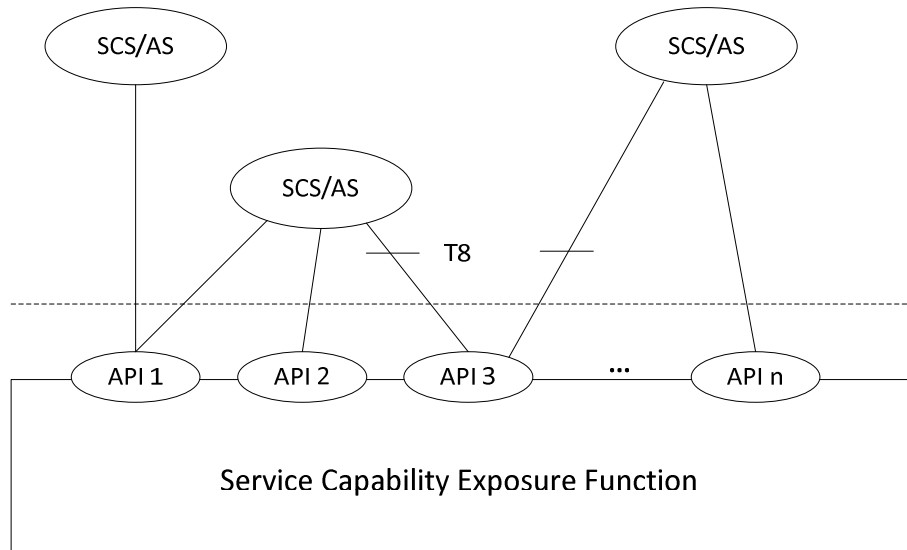


Figure 4.1.1: Northbound API of 3GPP Architecture Service Capability Exposure

4.2 Northbound API 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, SCEF functioning as the CTF, may generate accounting metrics sets for Northbound Application Program Interfaces (APIs) CDRs:

- the SCEF, to record Application Program Interfaces transaction.

If the SCEF generating the charging information has an integrated CDF, then the SCEF can produce CDRs. The CGF may also be integrated in the SCEF, or it may exist as a physically separate entity.

If the CGF is external to the SCEF /CDF, then the SCEF/CDF forwards the CDRs to the CGF across the Ga interface. If the CDF is external to the SCEF, the charging events are transferred from the SCEF to the CDF via the Rf interface specified in TS 32.299 [50].

When an external CGF is used, this CGF may also be used by other. It should be noted that the CGF may also be an integrated component of the BD – in this case, the Bea 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.

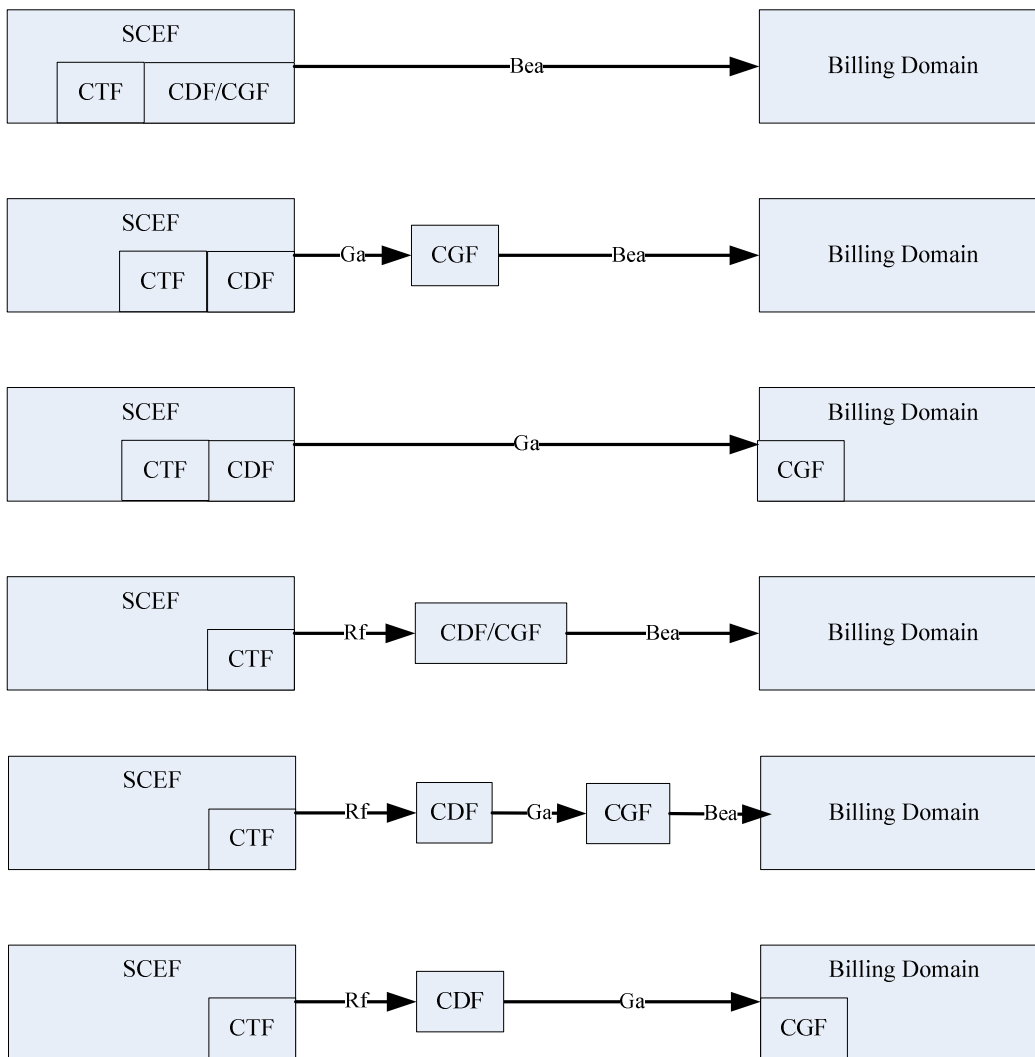


Figure 4.2.1: Northbound API offline charging architecture

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

4.3 Northbound API online charging architecture

Northbound API online charging is based on SCEF utilizing Ro interface and application towards the OCS as specified in TS 32.299 [50]. The Ro reference point covers all online charging functionality required for SCEF.

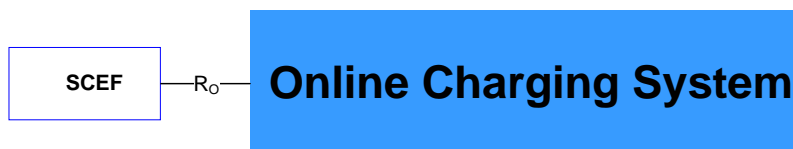


Figure 4.3.1: Northbound API online charging architecture

Details on the interfaces and functions can be found in TS 32.240 [1] for the general architecture components, TS 32.296 [53] for the OCS, and TS 32.299 [50] for the Ro application.

5 Northbound API charging principles and scenarios

5.1 Northbound API charging principles

5.1.0 General

The following are high level charging requirements for northbound API for Exposure Function which are specified in TS 23.682 [243]:

For northbound API invocation/notification, the SCEF shall collect the following charging information:

- invocations/notifications count of the northbound APIs.
- identification of the SCS/AS and the associated northbound API invocation/notification.
- timestamp of the northbound API invocation/notification.
- northbound API related information, e.g. location.

5.1.1 Northbound API procedures

All procedures that operate across the T8 reference point, as specified in 3GPP TS 23.682 [243] and TS 29.122 [230], are proposed as the following:

- Monitoring
- Resource management of Background Data Transfer
- Changing the chargeable party at session set up or during the session
- Non-IP Data Delivery
- Device Triggering
- Group Message Delivery
- Reporting of Network Status
- Communication Pattern Parameters Provisioning
- PFD Management
- Enhanced Coverage Restriction Control
- Network Parameter Configuration
- Setting up an AS session with required QoS
- MSISDN-less Mobile Originated SMS

The following clauses describe the trigger conditions and simplified message flows for Event Based Charging(IEC/ECUR), as specified in 3GPP TS 32.299 [50].

5.2 Northbound API offline charging scenarios

5.2.1 Basic principles

If charging is supported by an SCEF, it shall be able to collect charging information per T8 transaction.

The SCS/AS is identified by the SCS Identifier, which T8 transaction between SCEF and SCS/AS can be determined by a T8 Transaction Reference ID (TTRI) and T8 Long Term Transaction Reference ID (TLTRI). The Identifiers are stored on both the SCEF and the SCS/AS for the duration of the transaction.

The following chargeable events are defined for SCEF charging for all Northbound APIs:

- Northbound API invocation/ notification per T8 transaction.
- Expiry of an operator configured time limit per T8 transaction.
- Expiry of an operator configured Northbound API invocation limit per T8 transaction.

Management intervention may also force trigger a chargeable event.

The subscriber is the API invoker (e.g. SCS, AS) of the Northbound APIs.

5.2.2 Rf message flows

5.2.2.1 Triggers for charging events from SCEF

When a charging event is reported to the CDF, it includes the details such as SCEF address, charging information with corresponding charging events to the CDF.

The trigger conditions specified in Table 5.2.2.1.1 are applicable for charging information collection.

Table 5.2.2.1.1: Triggers for Charging Data Request from SCEF

Message	Triggering conditions
Charging Data Request[Event]	T8 transaction creation via HTTP POST
	T8 transaction update via HTTP PATCH message, HTTP PUT message received by SCEF
	T8 transaction termination via HTTP DELETE

5.2.3 CDR generation

5.2.3.1 Introduction

For the exposure functions SCEF, an exposure function API CDR is generated for subsequent transfer to the Charging Gateway Function (CGF).

The following clauses describe the trigger conditions for these exposure function API CDRs creation, update and closure.

5.2.3.2 Triggers for EA-SCE-CDR creation and closure

5.2.3.2.1 Triggers for EA-SCE-CDR generation

A EA-SCE-CDR is used to collect charging information related to API invocation/notification offline charging from the SCEF.

A single EA-SCE-CDR shall be generated for each event when the API invocation or notification is encountered.

5.2.4 Ga record transfer flows

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

5.2.5 Bea CDR file transfer

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

5.3 Northbound API online charging scenarios

5.3.1 Basic principles

5.3.1.1 General

Northbound API online charging is performed by the SCEF using the common Ro based Credit-Control application specified in TS 32.299 [50]. In order to provide the data required for the management activities outlined in TS 32.240 [1], the SCEF shall be able to perform online charging for the following:

- Charging data related to northbound API invocation;
- Charging data related to northbound API notification.

Event based online charging (IEC/ECUR) and Session based online charging (SCUR) are required in the SCEF.

5.3.2 Ro message flows

5.3.2.1 Event Based Charging

This clause contains message flows for the different operation models IEC and ECUR, when the one-time API invocation is per T8 interaction is activated. e.g. Enhanced Coverage Restriction Control API, MSISDN-less Mobile Originated SMS API.

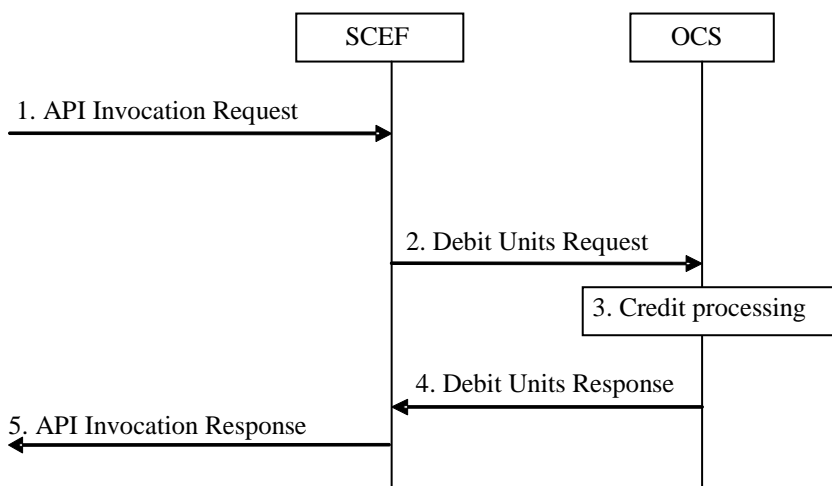


Figure 5.3.2.1.1: Online charging in API Invocation for IEC

- 1) SCEF receives an API invocation Request.
- 2) The SCEF triggers a Debit Units Request message to the OCS.
- 3) The OCS performs the appropriate credit processing based on the received request.
- 4) The OCS responds with a Debit Units Response message to the SCEF.
- 5) If authorized, the SCEF continues the API invocation processing and send out the API Invocation Response.

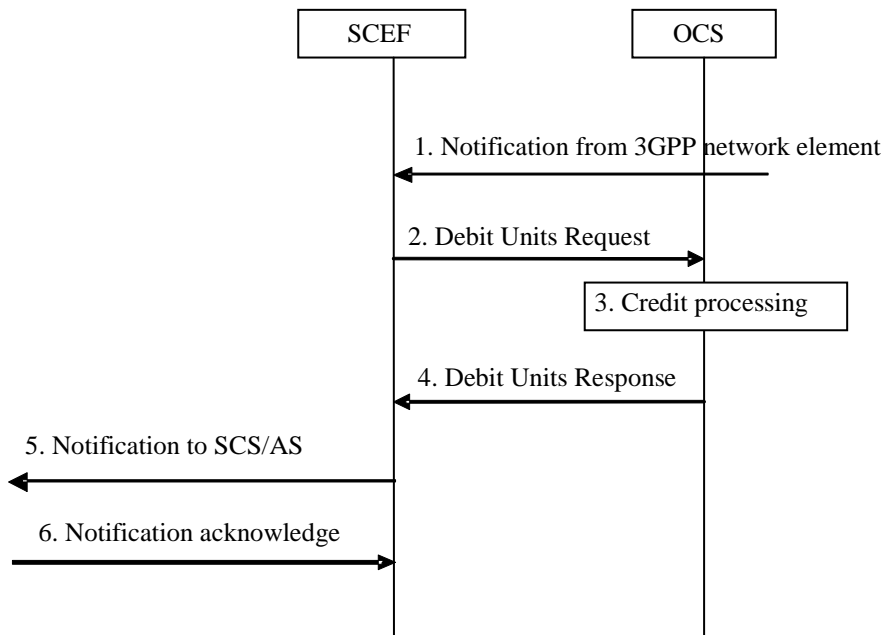


Figure 5.3.2.1.2: Online charging in API Notification for IEC

- 1) SCEF receives a notification from 3GPP network element.
- 2) The SCEF triggers a Debit Units Request message to the OCS.
- 3) The OCS performs the appropriate credit processing based on the received request.
- 4) The OCS responds with a Debit Units Response message to the SCEF.
- 5) SCEF sends the notification to SCS/AS.
- 6) SCEF receives acknowledgement for the notification.

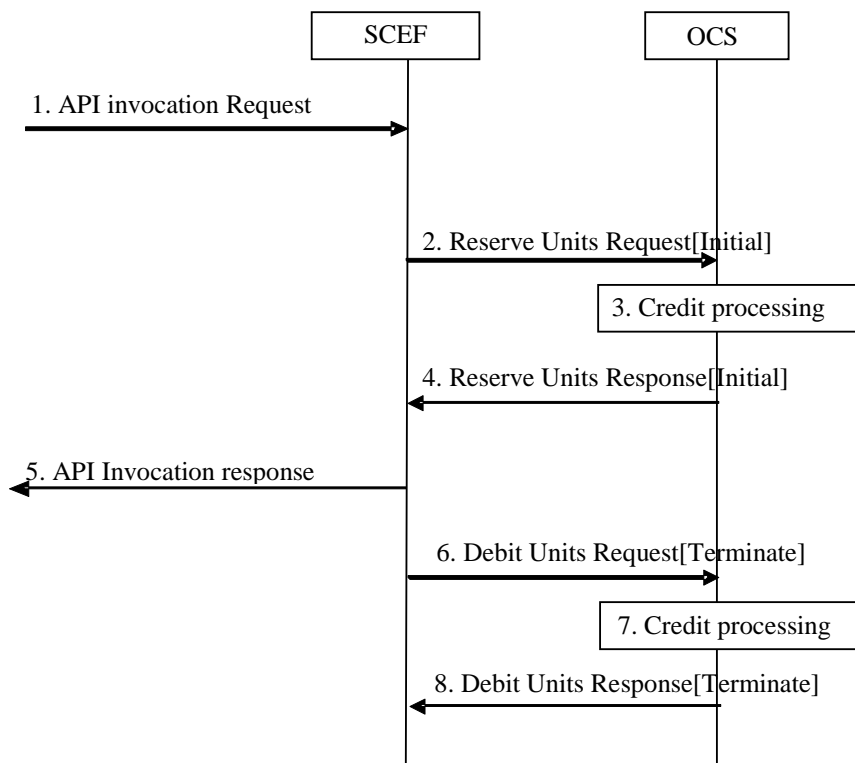


Figure 5.3.2.1.3: Online charging in API Invocation for ECUR

- 1) SCEF receives an API invocation Request.2) The SCEF triggers a Reserve Units Request [Initial] message to the OCS.
- 3) The OCS performs the appropriate credit processing based on the received request.
- 4) The OCS responds with a Reserve Units Response message to the SCEF.
- 5) If authorized, the SCEF continues the API invocation processing and send out the API Invocation Response.
- 6) The SCEF triggers a Debit Units Request [Terminate] message to the OCS reporting the successful event transaction.
- 7) The OCS performs the appropriate credit processing based on the received request.
- 8) The OCS responds with a Debit Units Response message to the SCEF.

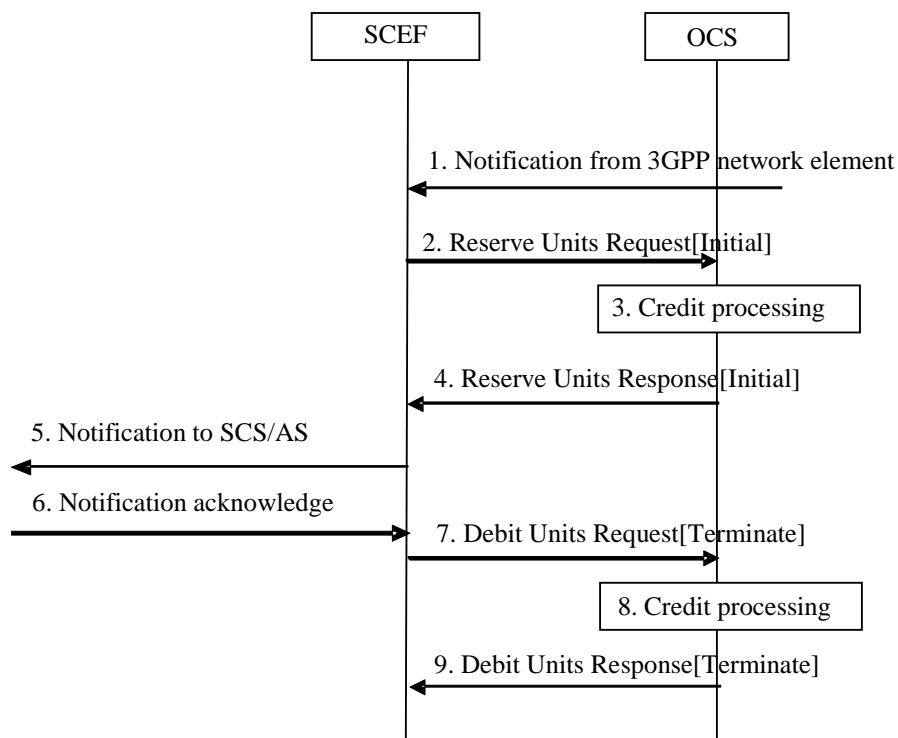


Figure 5.3.2.1.4: Online charging in API Notification for ECUR

- 1) SCEF receives a notification from 3GPP network entities.
- 2) The SCEF triggers a Reserve Units Request [Initial] message to the OCS.
- 3) The OCS performs the appropriate credit processing based on the received request.
- 4) The OCS responds with a Reserve Units Response message to the SCEF.
- 5) SCEF sends the notification to SCS/AS.
- 6) SCEF receives acknowledgement for the notification.
- 7) The SCEF triggers a Debit Units Request [Terminate] message to the OCS reporting the successful event transaction.
- 8) The OCS performs the appropriate credit processing based on the received request.
- 9) The OCS responds with a Debit Units Response message to the SCEF.

6. Definition of charging information

6.1 Data description for Northbound API offline charging

6.1.1 Rf message contents

6.1.1.1 General

The Exposure Function API 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	SCEF	CDF
Charging Data Response	CDF	SCEF

The following clauses describe 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 SCEF as used for Exposure Function API 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 Exposure Function API domain service.
Service Information	O _M	This field holds the Exposure Function API 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 Exposure Function API offline charging.

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 Bea interface

6.1.3.1 General

The following standard CDRs content and format are considered:

- EA-SCE-CDR generated for exposure function API from the SCEF.

For each of the CDR types, a parameter table, which gives a short description of the parameters, is provided. The category in the tables is used according to the charging data configuration defined in clause 5.4 of TS 32.240 [1]. Full definitions of the CDR parameters, sorted by the name in alphabetical order, are provided in TS 32.298 [51].

6.1.3.2 Exposure Function API charging data (EA-SCE-CDR)

Exposure function API record shall be produced for each API invocation to the SCEF. The fields in the record are specified in table 6.1.3.2.1.

Table 6.1.3.2.1: Exposure function API from SCEF charging data (EA-SCE-CDR)

Field	Category	Description
Record Type	M	SCEF exposure function API record.
Retransmission	O _c	This parameter, when present, indicates that information from retransmitted Accounting Requests has been used in this CDR.
Service Context Id	O _M	This parameter indicates the CDR is applicable to exposure function API service.
Node Id	O _{M,M}	Name of the recording entity.
SCEF ID	M	This parameter holds the identity of the SCEF used for this API invocation.
SCEF Address	O _c	This parameter holds the IP address of SCEF.
API Identifier	M	This field holds the identity of API for each API invocation.
TLTRI	O _c	This field holds the T8 Long Term Transaction Reference ID.
TTRI	O _c	This field holds the T8 Transaction Reference ID.
SCS/AS Address	M	This field holds the IP address of SCS/AS
Event Timestamp	M	This field holds the time stamp of the event reported.
API Invocation Timestamp		This field holds the time stamp when the API invocation request is submitted to the SCEF from SCS/AS.
API Direction	O _c	This field holds the direction to indicate the API invocation or API notification.
API Network Service Node	O _c	This field holds the identifier of the network element (e.g. SGSN, RCAF) that triggers the API notification as defined in TS 23.682 [243].
API Content	O _c	This field holds the API content (e.g. location, Monitoring Type) used in the T8 transaction for the API invocation request, if available.
API Size	O _c	This field holds the size of API payload.
API Result Code	O _c	This field holds the result of API Invocation.
External Identifier	O _c	This field holds the external Identifier identifying the served party associated to the IMSI or MSISDN or External Group ID, if available.
Local Record Sequence Number	O _M	Consecutive record number created by this node. The number is allocated sequentially including all CDR types.
Record Extensions	O _c	A set of network operator/manufacture specific extensions to the record. Conditioned upon the existence of an extension.

6.2 Data description for Northbound API online charging

6.2.1 Ro message contents

6.2.1.0 Introduction

The SCEF generates Debit / Reserve Units information that can be transferred from the CTF to the OCF. For this purpose, SCEF online charging utilizes the *Debit Units and Reserve Units* procedure that is specified in the 3GPP Debit / Reserve Units operation in TS 32.299 [50].

6.2.1.1 Summary of message formats

Table 6.2.1.1.1 describes the use of these messages for SCEF online charging.

Table 6.2.1.1.1: SCEF online charging messages contents

Command-Name	Source	Destination
Debit / Reserve Units Request	SCEF	OCF
Debit / Reserve Units Response	OCF	SCEF

This clause describes the different fields used in the Debit / Reserve Units Request and Debit / Reserve Units Responses messages and the category in the tables are used according to the charging data configuration defined in clause 5.4 of TS 32.240 [1].

Detailed descriptions of the fields are provided in TS 32.299 [50].

6.2.1.2 Structure for the Credit-Control message formats

6.2.1.2.1 Debit/Reserve Units Request message

Table 6.2.1.2.1.1 illustrates the basic structure of a *Debit / Reserve Units Request* message from SCEF as used for exposure function API online charging.

Table 6.2.1.2.1.1: Debit / Reserve Units Request message contents for exposure function API

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 Identifier	M	Described in TS 32.299 [50]
Operation Token	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]
Destination Host	O _C	Described in TS 32.299 [50]
User Name	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]
Subscriber Identifier	O _M	This field contains the identification of the subscriber (i.e. SCS/AS Identifier) that uses the requested service.
Termination Cause	O _C	Described in TS 32.299 [50]
Requested-Action	O _C	This field contains the requested action, used for IEC only.
Multiple Operation	O _M	This field indicate the occurrence of multiple operations.
Multiple Unit Operation	O _C	This field contains the parameter for the quota management.
Proxy Information	O _C	This field contains the parameter of the proxy.
Route Information	O _C	This field contains the parameter of the route.
Service Information	O _M	This field holds the SCEF specific parameter and is described in clause 6.3.

6.2.1.2.2 Debit / Reserve Units Response message

Table 6.2.1.2.2.1 illustrates the basic structure of a Debit / Reserve Units Response message as used for SCEF charging.

This message is always used by the OCS as specified below, independent of the receiving SCEF and the operation type that is being replied to.

Table 6.2.1.2.2.1: Debit / Reserve Units Response message contents for exposure function API

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 Identifier	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]
Multiple Unit Operation	O _C	Described in TS 32.299 [50]
Operation Failure Action	O _C	Described in TS 32.299 [50]
Operation Event Failure Action	O _C	Described in TS 32.299 [50]
Redirection Host	O _C	Described in TS 32.299 [50]
Redirection Host Usage	O _C	Described in TS 32.299 [50]
Route Information	O _C	Described in TS 32.299 [50]
Failed parameter	O _C	Described in TS 32.299 [50]
Service Information	O _C	Described in TS 32.299 [50]

6.3 Northbound API charging specific parameters

6.3.1 Definition of Northbound API charging information

6.3.1.1 Exposure Function API charging information assignment for Service Information

The components in the Service Information that are used for Exposure Function API charging can be found in table 6.3.1.1.1.

Table 6.3.1.1.1: Service Information used for Exposure Function API 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 _M	This field contains the identification of the user (i.e. SCS Identifier).
IMS Information	O _M	This is a structured field and holds IMS specific parameters. The complete structure is defined in TS 32.260 [20].
Node Functionality	O _c	This IE Identifies the type of record.
Exposure Function API Information	O _M	This is a structured field and holds the Exposure Function API specific parameters. The details are defined in clause 6.3.1.2.

6.3.1.2 Definition of the Exposure Function API Information

Exposure Function API specific charging information is provided within the Exposure Function API Information. The fields of the Exposure Function API Information are indicated with the SCEF from which the information is sent.

The detailed structure of the Exposure Function API Information can be found in table 6.3.1.2.1.

Table 6.3.1.2.1: Structure of the Exposure Function API Information

Information Element	Category	Description
Supported Features	O _c	This field holds the list of features supported by the SCEF, CDF or OCF as defined in clause 6.3.1.3.
External Identifier	O _c	This parameter holds the external Identifier identifying the served party associated to the IMSI or MSISDN or External Group ID, if available
SCEF ID	O _c	This parameter holds the Diameter identity of the SCEF used for API invocation.
SCEF Address	O _c	This parameter holds the IP address of SCEF.
API Identifier	O _M	This parameter holds the identity of API
SCS/AS Address	O _M	This parameter holds the IP address of SCS/AS which invoke the API via T8 interface
TTRI	O _c	This parameter holds T8 Transaction Reference ID which refers to transactions (e.g. Set Chargeable Party Request followed by Set Chargeable Party Response, NIDD Submit, etc.) between the SCEF and the SCS/AS when using T8 interface.
TLTRI	O _c	This parameter holds T8 Long Term Transaction Reference ID is which refers to long term transaction (e.g. NIDD Configuration, Group Message Request, Monitoring Event configuration) between the SCEF and the SCS/AS when using T8 interface.
Event Timestamp	M	This field holds the time stamp of the event reported.
API Invocation Timestamp	O _c	This parameter holds the time stamp when API Invocation request was submitted to the SCEF from SCS/AS.
API Direction	O _c	This field holds the direction to indicate the API invocation or API notification.
API Network Service Node	O _c	This field holds the identifier the network element (e.g. SGSN, RCAF) that triggers the API notification, as defined in 23.682 [243].
API Content	O _c	This parameter holds the API content (e.g. Location, Monitoring Type) used in the T8 transaction for the API invocation request, if available.
API Size	O _c	This parameter holds size of API payload.
API Result Code	O _c	This parameter holds the result of API Invocation.

6.3.1.3 Supported features

The Supported features information that is used for Exposure Function API charging is based on the information defined for the supported features mechanism specified in clause 6.5.x of TS 32.299 [50].

The following table defines the features applicable for the feature lists with a Feature-List-ID of 1.

Table 6.3.1.3.1: Features of Feature-List-ID 1 used in Exposure Function API charging

Feature bit	Feature	Description	Online/Offline
0	NAPS-CH	This feature indicates the support Exposure Function API charging.	Both
Feature bit: The order number of the bit within the Feature-List AVP where the least significant bit is assigned number "0". Feature: A short name that can be used to refer to the bit and to the feature, e.g. "EPS". Feature in this table is always mandatory since it relates to the charging functionality of a network feature. Description: A clear textual description of the feature.			

6.3.2 Detailed message format for offline charging

The following clause specifies per Operation Type the charging data that are sent by SCEF for Exposure Function API offline charging.

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 6.3.2.1 illustrates the basic structure of the supported fields in the *Charging Data Request* message for Exposure Function API offline charging.

Table 6.3.2.1: Supported fields in *Charging Data Request* message

Information Element	Node Type	SCEF
	Supported Operation Types	S/I/S/E
Session Identifier		---E
Originator Host		---E
Originator Domain		---E
Destination Domain		---E
Operation Type		---E
Operation Number		---E
Operation Identifier		---E
User Name		---E
Destination Host		---E
Operation Interval		---E
Origination State		---E
Origination Timestamp		---E
Proxy Information		---E
Route Information		---E
Operation Token		---E
Subscriber Identifier		---E
Service Information with IMS Information and Exposure Function API Information		
Supported Features		---E
Node Functionality		---E
External Identifier		---E
SCEF ID		---E
SCEF Address		---E
TTRI		---E
TLTRI		---E
API Identifier		---E
SCS/AS Address		---E
Event Timestamp		---E
API Invocation Timestamp		---E
API Direction		---E
API Network Service Node		---E
API Content		---E
API Size		---E
API Result Code		---E

Table 6.3.2.2 illustrates the basic structure of the supported fields in the *Charging Data* Response message for Exposure function API offline charging.

Table 6.3.2.2: Supported fields in *Charging Data* Response message

Information Element	Node Type	SCEF
	Supported Operation Types	S/I/S/E
Session Identifier		---E
Operation Result		---E
Originator Host		---E
Originator Domain		---E
Operation Type		---E
Operation Number		---E
Operation Identifier		---E
Operation Interval		---E
Error Reporting Host		---E
Origination State		---E
Origination Timestamp		---E
Proxy Information		---E
Session Identifier		---E
Service Information with Exposure Function API Information		
Supported Features		---E

6.3.3 Detailed message format for online charging

The Operation types are listed in the following order: I [initial] /U [update]/ T [terminate]/E [event]. Therefore, when all Operation types are possible it is marked as IUTE. If only some Operation types are allowed for a node, only the appropriate letters are used (i.e. IT or E) as indicated in the table heading. The omission of an Operation type for a particular field is marked with "-" (i.e. I-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 Debit / Reserve Units Request for exposure function API online charging.

Table 6.3.3.1: Supported fields in Debit / Reserve Units Request message

Information Element	Service Type	SCEF
	Supported Operation Types	I/U/T/E
Session Identifier		---E
Originator Host		---E
Originator Domain		---E
Destination Domain		---E
Operation Identifier		---E
Operation Token		---E
Operation Type		---E
Operation Number		---E
Destination Host		---E
User Name		---E
Origination State		---E
Origination Timestamp		---E
Subscriber Identifier		---E
Termination Cause		---E
Requested Action		---E
Multiple Operation		---E
Multiple Unit Operation		---E
Proxy Information		---E
Route Information		---E
Service Information		---E
Service Information with IMS and Exposure Function API Information		
Supported Features		---E
Node Functionality		---E
SCEF Node		---E
SCEF Address		---E
SCS/AS Address		---E
API Identifier		---E
TTRI		---E
TLTRI		---E
Event Timestamp		---E
API Invocation Timestamp		---E
API Direction		---E
API Network Service Node		---E
API Content		---E
API Size		---E
API Result Code		---E
External Identifier		---E

Table 6.3.3.2 illustrates the basic structure of the supported fields in the Debit / Reserve Units Response for exposure function API online charging.

Table 6.3.3.2: Supported fields in Debit / Reserve Units Response Message

Information Element	Node Type	SCEF
	Supported Operation Types	I/U/T/E
Session Identifier		---E
Operation Result		---E
Originator Host		---E
Originator Domain		---E
Operation Identifier		---E
Operation Type		---E
Operation Number		---E
Operation Failover		---E
Multiple Unit Operation		---E
Operation Failure Action		---E
Redirection Host		---E
Redirection Host Usage		---E
Redirection Cache Time		---E
Route Information		---E
Failed parameter		---E
Service Information		---E
Service Information with Exposure Function API Information		
Supported Features		I---

6.4 Bindings for Northbound API offline charging

This clause aims to describe the mapping between the Service Information fields, AVPs, Ies and CDR parameters for exposure function API online and offline charging.

Table 6.4.1 describes the mapping of the Diameter Accounting AVP, Ies and CDR to the CDR parameters of EA-SCE-CDR.

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

CDR Parameter	Information Element	AVP
Service Context Id	Service Context Id	Service-Context-Id
	Service Information	Service-Information
	IMS Information	IMS-Information
Record Type	Node Functionality	Node-Functionality
	API invocation Information	API-invocation-Information
-	Supported Features	Supported-Features
External Identifier	External Identifier	External-Identifier
SCEF ID	SCEF ID	SCEF-ID
SCEF Address	SCEF Address	SCEF-Address
SCS/AS Address	SCS/AS Address	SCS/AS- Address
API Identifier	APIIdentifier	API-Identifier
TTRI	TTRI	TTRI
TLTRI	TLTRI	TLTRI
Event Timestamp	Event Timestamp	Event-Timestamp
API Invocation Timestamp	API Invocation Timestamp	API-Invocation-Timestamp
API Direction	API Direction	API-Direction
API Network Service Node	API Network Service Node	API-Network-Service-Node
API Content	API Content	API -Content
API Size	API Size	API-Size
API Result Code	API Result Code	API-Result-Code

Annex A (normative): Charging characteristics

A.1 General

A subscriber (The API Invoker) may have Charging Characteristics assigned to his subscription. Default charging characteristics may be pre-provisioned on the SCEF. The charging information content is configured for each API, including charging method (online and offline charging), Event based charging, whether report the message content or not.

The Charging Characteristics parameter format is specified TS 32.298 [51]. Each bit of the string of 16 bits corresponds to a specific charging behaviour which is defined on a per operator basis, configured within the SCEF and pointed when bit is set to "1" value.

One way to define a charging behaviour could be to associate it to a specific usage, which may consist of a set of trigger profiles associated to CDR types e.g.:

- **EA-SCE-CDR:** activate/deactivate CDRs, time limit, data volume limit, maximum number of API invocation.

In addition to these trigger sets, a CDF/CGF address may also be included.

Annex B (informative): Change history

Change history							
Date	Meeting	Tdoc	CR	Rev	Cat	Subject/Comment	New version
2017-08		S5-174086				First creation of skeleton.	0.0.0
2017-08	SA5 #114	S5-174306 S5-174307 S5-174308 S5-174309				Update of the skeleton Scope and Reference Definitions, Symbols and Abbreviations Architecture considerations	0.1.0
2017-10	SA5 #115	S5-175296 S5-175297 S5-175300				Addition of the charging principle for NAPS Addition of the online charging principle for NAPS Addition of the offline charging principle for NAPS	0.2.0
2018-02	SA5 #117	S5-181213 S5-181311 S5-181313 S5-181314 S5-181315 S5-181316 S5-181317 S5-181318				Correction on the name of Bapi Northbound API offline charging scenarios Northbound API online charging scenarios Data description for Northbound API offline charging Data description for Northbound API online charging Northbound API charging specific parameters Bindings for Northbound API offline charging Annex for charging Charging characteristics	0.3.0
2018-04	SA5 #118	S5-182337				Refinement on Northbound API charging description, EditHelp fixes	0.4.0
2018-05	SA5 #119	S5-183083 S5-183360				Correction on the format of TS 32.254 Add Supported Features	0.5.0
2018-05	SA5 #119					Implementing EditHelp comments (editorial)	0.6.0
2018-06	SA#80	SP-180404				Presented for information and approval	1.0.0
2018-06	SA#80					Upgrade to change control version	15.0.0

History

Document history		
V15.0.0	September 2018	Publication