OMA Online Charging Interface

Candidate Version 1.0 – 26 Sep 2006

Open Mobile Alliance

OMA-TS-Charging_Online-V1_0-20060926-C

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1. Scope

The charging architecture document [CHRG_AD] identifies two different interfaces between the Charging Enabler User and the charging enabler: Offline charging interface (CH-1) and online charging interface (CH-2).

The scope of this document is to provide the technical specification of the CH-2 interface.

This document defines:

- Messages and messages types of the CH-2 interface.
- Data elements used in the messages with their descriptions and possible values.
- It also illustrates the flows of information exchanged between the Charging Enabler User and charging enabler through time in different scenarios.
- Bindings of OMA CH-2 interface to a specific protocol (e.g. Diameter protocol), and a description of the layered protocol architecture.

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2. References

2.1 Normative References

[CHRG_AD] "Charging Architecture". Open Mobile Alliance™. OMA-AD-Charging-V1_0, URL: http://www.openmobilealliance.org/

[IOPPROC] "OMA Interoperability Policy and Process", Version 1.1, Open Mobile Alliance™, OMA-IOP-Process-V1_1, URL: http://www.openmobilealliance.org/

[OMNA] Open Mobile Naming Authority (OMNA), URL: http://www.openmobilealliance.org/tech/omna/index.htm

[RFC2119] "Key words for use in RFCs to Indicate Requirement Levels", S. Bradner, March 1997, URL: http://www.ietf.org/rfc/rfc2119.txt

[RFC3588] "Diameter Base Protocol", P. Calhoun, J. Loughney, E. Guttman, G. Zorn, J. Arkko. September 2003, URL: http://www.ietf.org/rfc/rfc3588.txt

[RFC4006] "Diameter Credit-Control Application", H. Hakala, L. Mattila, J-P. Koskinen, M. Stura, J. Loughney. August 2005, URL: http://www.ietf.org/rfc/rfc4006.txt

[TS32.299] "Telecommunication management; Charging management; Diameter Charging Applications", 3GPP TS32.299 Rel-6, URL: http://www.3gpp.org

2.2 Informative References

[OMA-DICT] "Dictionary for OMA Specifications", Open Mobile Alliance™, OMA-Dictionary, URL: http://www.openmobilealliance.org/

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3. Terminology and Conventions

3.1 Conventions

The key words “MUST”, “MUST NOT”, “REQUIRED”, “SHALL”, “SHALL NOT”, “SHOULD”, “SHOULD NOT”, “RECOMMENDED”, “MAY”, and “OPTIONAL” in this document are to be interpreted as described in [RFC2119].

All sections and appendixes, except “Scope” and “Introduction”, are normative, unless they are explicitly indicated to be informative.

3.2 Definitions

For the purposes of this document, the abbreviations given in [OMA-DICT] apply and the following also apply:

Authorization	The act of determining whether something or someone will be granted access to a resource.
CH-1	Offline Charging Interface
CH-2	Online Charging Interface
Charging Aggregation	See Aggregation.
Charging Enabler	A set of functions that enable other OMA enablers, applications, or other resources to charge service users.
Charging Enabler User	A Charging Enabler User invokes and interacts with the Charging Enabler
Charging Event	A set of charging information sent by the Charging Enabler User for further processing.
Charging Infrastructure	This term denotes any infrastructure that maintains the charging accounts.
Correlation	Making a connection or relationship between Charging Events that belong to the same service, but may not be in the same session.
Quota	A prescribed number or share of service units generally associated with service usage. (E.g. a maximum amount of credits, time or volume for use of a service.)
Rating	The function of determining the price or value of individual Charging Events.
Resource	Any component, enabler, function or application that can receive and process requests.
Unit Determination	Unit Determination refers to the calculation of the number of service units (e.g. data volume, time and events) that shall be assigned prior to starting service delivery. • With Centralized Unit Determination, the Charging Enabler determines the number of service units that a certain end-user can consume based on a service identifier received from the Charging Enabler User. • With the Decentralized Unit Determination approach, the Charging Enabler User determines itself how many units are required to start service delivery, and requests these units from the Charging Enabler. After checking the end-user's account balance, the Charging Enabler returns the number of granted units to the Charging Enabler User.

3.3 Abbreviations

For the purposes of this document, the abbreviations given in [OMA-DICT] apply and the following also apply:

3G	3rd Generation
3GPP	3rd Generation Partnership Project
3GPP/2	3GPP and 3GPP2
3GPP2	3rd Generation Partnership Project 2
ABNF	Augmented Backus-Naur Form

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AD	Architecture Document
ASA	Abort-Session-Answer
ASR	Abort-Session-Request
AVP	Attribute Value Pair
BCAST	Broadcast
CC	Credit Control
CCA	Credit Control Answer
CCR	Credit Control Request
CBR	Check Balance Result
CEA	Capability Exchange Answer
CER	Capability Exchange Request
DPA	Disconnect Peer Answer
DPR	Disconnect Peer Request
DWA	Device Watchdog Answer
DWR	Device Watchdog Request
GSU	Granted Service Unit
IETF	Internet Engineering Task Force
IM	Instant Messaging
IMS	IP Multimedia System
IMSI	International Mobile Subscriber Identity
IP	Internet Protocol
MSCC	Multiple Services Credit Control
MSISDN	Mobile Subscriber ISDN Number
OMA	Open Mobile Alliance
OMNA	Open Mobile Naming Authority
OSE	OMA Service Environment
PoC	Push-to-Talk over Cellular
RAA	Re-Auth-Answer
RAR	Re-Auth-Request
RD	Requirements Document
RFC	Request for Comments
RSU	Requested Service Unit
SCR	Static Compliance Requirement
SI	Service Identifier
SIP	Session Initiation Protocol
TS	Technical Specification
URI	Uniform Resource Identifier

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4. Introduction

Online charging is a charging process where charging information can affect, in real time, the service rendered and therefore directly interacts with the session/service control.

This document describes the technical specification of the OMA CH-2 Online Charging interface. The CH-2 interface lies between the Charging Enabler User and the Charging Enabler.

The Charging Enabler User utilizes this interface to communicate charging information to the underlying Charging Infrastructure using the Charging Enabler. But at the same time, the Charging Enabler User needs a kind of feedback to perform a control of the service being rendered. For this reason, the interface defines a request-response messages structure that is used for the Charging Enabler User to perform the needed control.

This document is a guide for developers of a Charging Enabler User that needs an online charging process in order to provide the desired service features to subscribers.

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5. Messages in CH-2

The OMA CH-2 Online Charging Interface supports several different types of messages which are described in this chapter. These messages can be used to realize different online charging flows between the Charging Enabler User and the Charging Enabler. The flows are described later in this document in chapter 7.

The different online charging message types can be grouped into three categories based on similar structure and purpose of use. This hierarchy of message types is illustrated in the figure below.

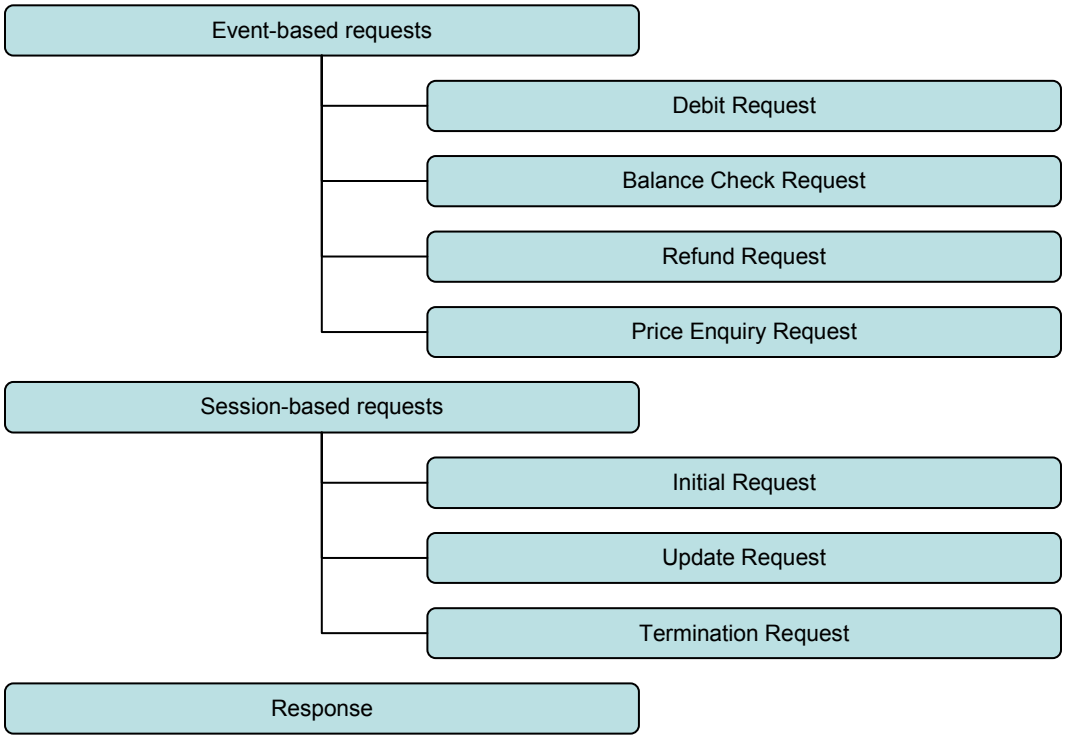

Figure 1: Messages in CH-2

First of all, there are **requests** and **responses**. Requests are sent by the Charging Enabler User to the Charging Enabler. Responses are sent by the Charging Enabler to the Charging Enabler User.

Online Charging interactions are always initiated by the Charging Enabler User. **Online Charging Event Requests** are requests that are, on the interface and protocol level, independent of each other. In other words, each Event Request starts a new interaction and is followed by a single response which ends this interaction. From the interface and protocol perspective, all following Event Requests are unrelated to the previously completed interactions.

Online Session Requests relate to interactions between the Charging Enabler User and the Charging Enabler where several related consecutive requests constitute a session, i.e. a chain of request-response pairs.

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6. Message Descriptions

6.1 Debit Units Requests

Online Charging Event request and session request messages share the same basic data element structure which is described below. The "Category" column indicates whether the element is mandatory or optional. The "level" column allows the reader to clearly identify the hierarchy in between data elements. Let's take the example of a data element "A" (level n) followed by data elements "B" and "C" (both being level n+1). This means that element A is composed of element B and element C. The specific parameter values, as they are used in specific messages, are explained in the subsections following the table.

Level	OMA Charging Data Element	Category	Description
1	Session Id	Mandatory	This data element is used to identify a specific session. All messages pertaining to a specific session must use the same value.
1	Origin Host	Mandatory	This data element identifies the endpoint that originated the message.
1	Origin Realm	Mandatory	This data element identifies the realm of the originator of any message.
1	Destination Realm	Mandatory	This data element identifies the realm the message is to be routed to.
1	Service Context Id	Mandatory	This data element contains a value to identify the service/enabler specification in the context of which the Charging Events must be interpreted. Data elements such as Service Identifier, Service Specific Units, contain service specific values that are defined within a particular service context identified in this data element.
1	Request Type	Mandatory	This data element contains the reason for sending the online charging request message
1	Request Number	Mandatory	This data element identifies this request within one session.
1	Destination Host	Optional	This data element identifies the address of the Charging Enabler.
1	Origin State Id	Optional	This data element contains a monotonically increasing value that is advanced whenever an entity restarts with loss of previous state.
1	Event Timestamp	Optional	This data element records the time at which the reported event occurred.
1	Subscription Id	Optional	This data element identifies the end user's subscription
2	Subscription Id Type	Mandatory	This data element identifies which type of identifier is carried by the subscription-Id e.g.: email, MSISDN, IMSI, SIP URI...
2	Subscription Id Data	Mandatory	This data element identifies the end user.
1	Termination Cause	Optional	This data element indicates the reason why a session was terminated on the access device.
1	Requested Action	Optional	This data element contains the requested action being sent by Charging Enabler User when Request Type is set to EVENT_REQUEST.

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Level	OMA Charging Data Element	Category	Description
1	Multiple service indicator	Optional	This data element indicates the usage of the MSCC. It's capable of handling multiple services independently within an online charging Session
1	Multiple Services Credit Control	Optional	This data element contains a *list* of data elements from a single Charging Enabler User that is providing multiple services.
2	Requested Service Unit	Optional	This data element contains the amount of used units measured from the point when the service became active or, if interim interrogations are used during the session, from the point when the previous measurement ended.
3	Time	Optional	This data element indicates the length of the requested, granted, or used time in seconds.
3	Money	Optional	This data element specifies the monetary amount in the given currency. The Currency Code field should be included when This data element is included.
4	Unit Value	Mandatory	This data element describes a value for instance a monetary value. It consists of Value Digits and Exponent.
5	Value Digits	Mandatory	This data element contains the significant digits of a Unit Value without any decimal point.
5	Exponent	Optional	This data element contains the 10^{-x} exponent that should be applied to the Value Digits.
4	Currency Code	Optional	This data element specifies which currency is used in a monetary value described by the Money field.
3	Total Octets	Optional	This data element contains the total number of requested, granted, or used octets, regardless of the direction (sent or received).
3	Input Octets	Optional	This data element contains the number of requested, granted, or used octets that can be/have been received from the end user.
3	Output Octets	Optional	This data element contains the number of requested, granted, or used octets that can be/have been sent to the end user.
3	Service Specific Units	Optional	This data element specifies the number of service-specific units (e.g. number of events, points) given in a selected service. The service specific units always refer to the service identified in the Service Identifier field
2	Used Service Unit	Optional	This data element contains the amount of used units measured from the point when the service became active or, if interim interrogations are used during the session, from the point when the previous measurement ended.
3	Time	Optional	This data element indicates the length of the requested, granted, or used time in seconds.
3	Money	Optional	This data element specifies the monetary amount in the given currency. The Currency Code field should be included when This data element is included.
4	Unit Value	Mandatory	This data element describes a value for instance a monetary value. It consists of Value Digits and Exponent.
5	Value Digits		This data element contains the significant digits of a Unit Value without any decimal point.

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Level	OMA Charging Data Element	Category	Description
5	Exponent	Optional	This data element contains the 10^{-x} exponent that should be applied to the Value Digits.
4	Currency Code	Optional	This data element specifies which currency is used in a monetary value described by the Money field.
3	Total Octets	Optional	This data element contains the total number of requested, granted, or used octets regardless of the direction (sent or received).
3	Input Octets	Optional	This data element contains the number of requested, granted, or used octets that can be/have been received from the end user.
3	Output Octets	Optional	This data element contains the number of requested, granted, or used octets that can be/have been sent to the end user.
3	Service Specific Units	Optional	This data element specifies the number of service-specific units (e.g., number of events, points) given in a selected service. The service specific units always refer to the service identified in the Service Identifier field
2	Service Identifier	Optional	This data element contains the identifier of a specific service within the given service context, e.g operation type.
1	User Equipment Info	Optional	This is a grouped data element that can be used to indicate the identity and capability of the terminal the end-user is using.
2	User Equipment Info Type	Mandatory	User Equipment Info Type defines the type of user equipment information contained in User Equipment Info Value, e.g. IMEI or MAC.
2	User Equipment Info Value	Mandatory	Contains the identity of the user equipment.
1	Service Information	Optional	This data element contains all the Charging Enabler User specific information.
2	Service Generic Information	Optional	This data element contains information related to service usage that is common to different services/enablers.
3	Service Key	Optional	This data element can be used to identify the particular service item delivered.
3	Correlation Id	Optional	This data element contains information to correlate charging requests generated for different service components of theapplication.

Table 1: Debit Units Request message

6.1.1 Online Charging Event Request

6.1.1.1 Debit Request

The debit request can be used to combine the operations of checking sufficient account balance before service delivery and committing the debiting the account to the same request. In case the account balance is sufficient for the requested service usage, the account is also immediately debited and there is no need to perform a separate request to commit the credit reservation. Debit request could be used, for example, for the following reasons:

- There are certain service events for which service execution is always successful in the service environment.
- The delay between the service invocation and the actual service delivery to the end user can be sufficiently long that the use of the session-based charging would lead to unreasonably long charging sessions.

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In these cases, the Charging Enabler User SHOULD be sure that the requested service event execution will be successful when this request is used.

OMA Charging Data Element	Values
Requested Action	DIRECT_DEBITING

Table 2: Debit Request

6.1.1.2 Balance Check Request

The balance check request is used to check if the subscriber's account balance is sufficient to allow the requested service usage before any further operation. The response is of type yes/no.

OMA Charging Data Element	Values
Requested-Action	BALANCE_CHECK

Table 3: Balance Check Request

6.1.1.3 Refund Request

Some services may refund service units to the end user's account, for example gaming services.

OMA Charging Data Element	Values
Requested Action	REFUND_ACCOUNT

Table 4: Refund Request

6.1.1.4 Price Enquiry Request

The Charging Enabler User may need to know the cost of the service usage. Services offered by application service providers whose costs are not known by the Charging Enabler User might exist. The end user might also want to get an estimation of the cost of a service event before requesting it.

OMA Charging Data Element	Values
Requested-Action	PRICE_ENQUIRY

Table 5: Price Enquiry Request

6.1.2 Online Charging Session Requests

All online charging session request messages share the same basic data element structure which is described below. The specific parameter values and their meaning, as well as any additional data elements in the different session request types are explained in the subsections following the table.

6.1.2.1 Initial Request

Initial request is used to initiate a charging session and perform the first credit reservation by including the Requested-Service-Unit structure if necessary. In the initial request, Request Type is set to INITIAL_REQUEST as indicated in the table below.

OMA Charging Data Element	Values
Request Type	INITIAL_REQUEST
Request Number	0

Table 6: Initial Request

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6.1.2.2 Update Request

Update requests can be used during a charging session between the initial request and termination request to report used quota and/or request additional quota. To report usage, the Charging Enabler User may include the Used-Service-Unit structure, and to request quota, the Requested-Service-Unit structure can be used.

OMA Charging Data Element	Values
Request Type	UPDATE_REQUEST
Request Number	1…N

Table 7: Update Request

6.1.2.3 Termination Request

Termination request is used to close a charging session and to report all service usage that has not been reported in preceding update requests.

OMA Charging Data Element	Values
Request Type	TERMINATION _REQUEST
Request Number	N+1
Termination Cause	LOGOUT SERVICE_NOT_PROVIDED BAD_ANSWER ADMINISTRATIVE LINK_BROKEN AUTH_EXPIRED USER_MOVED SESSION_TIMEOUT

Table 8: Termination Request

Additional data elements in the termination request:

6.2 Debit Units Responses

The structure of the online charging response messages is described below. The "Category" column indicates whether the element is mandatory or optional. The "level" column allows the reader to clearly identify the hierarchy in between data elements. Let's take the example of a data element "A" (level n) followed by data elements "B" and "C" (both being level n+1). This means that element A is composed of element B and element C.

Level	OMA Charging Data Element	Category	Description
1	Session Id	Mandatory	This data element identifies a specific session. All messages pertaining to a specific session must use the same value.
1	Result Code	Mandatory	This data element indicates the result of a particular request.
1	Origin Host	Mandatory	This data element identifies the endpoint that originated the message.

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Level	OMA Charging Data Element	Category	Description
1	Origin Realm	Mandatory	This data element contains the realm of the originator of any message
1	Request Type	Mandatory	This data element contains the reason for sending the online charging request message
1	Request Number	Mandatory	This data element identifies this request within one session.
1	Session Failover	Optional	This data element contains an indication to the Charging Enabler User whether or not a failover handling is to be used when necessary.
1	Multiple Services Credit Control	Optional	This data element contains a list of data elements from a single Charging Enabler User that is providing multiple services.
2	Granted Service Unit	Optional	This data element contains the amount of units that the Diameter credit-control client can provide to the end user until the service must be released or the new Request must be sent.
3	Tariff Time Change	Optional	This data element indicates the time in seconds since January 1, 1900, 00:00 UTC until the tariff of the service will be changed.
3	Time	Optional	This data element indicates the length of the requested, granted, or used time in seconds.
3	Money	Optional	This data element specifies the monetary amount in the given currency. The Currency Code field should be included when This data element is included.
4	Unit Value	Mandatory	This data element describes a value for instance a monetary value. It consists of Value Digits and Exponent.
5	Value Digits		This data element contains the significant digits of a Unit Value without any decimal point.
5	Exponent	Optional	This data element contains the 10-x exponent that should be applied to the Value Digits.
4	Currency Code	Optional	This data element specifies which currency is used in a monetary value described by the Money field.
3	Total Octets	Optional	This data element contains the total number of requested, granted, or used octets regardless of the direction (sent or received).
3	Input Octets	Optional	This data element contains the number of requested, granted, or used octets that can be/have been received from the end user.
3	Output Octets	Optional	This data element contains the number of requested, granted, or used octets that can be/have been sent to the end user.
3	Service Specific Units	Optional	This data element specifies the number of service-specific units (e.g., number of events, points) given in a selected service. The service specific units always refer to the service identified in the Service Identifier field
2	Service Identifier	Optional	This data element contains the identifier of a service. The specific service the request relates to is uniquely identified by the combination of Service-Context-Id and Service-Identifier.

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Level	OMA Charging Data Element	Category	Description
2	Validity Time	Optional	This data element contains the validity time of the granted service units. The value field of the Validity Time field is given in seconds.
1	Cost Information	Optional	This data element is used to return the cost information of a service, which the Charging Enabler User can transfer transparently to the end user.
2	Unit Value	Mandatory	The Unit Value element contains the cost estimate (always type of money) of the service, in the case of price enquiry, or the accumulated cost estimation, in the case of credit-control session.
2	Currency Code	Mandatory	This data element specifies which currency is used in a monetary value described by the Unit Value field.
2	Cost Unit	Optional	Cost Unit specifies the applicable unit to the Cost Information element when the service cost is a cost per unit (e.g., cost of the service is $1 per minute). The Cost Unit can be minutes, hours, days, kilobytes, megabytes, etc.
1	Check Balance Result	Optional	This data element contains the result of the balance check. It is applicable only when the Requested Action element indicates BALANCE_CHECK in the corresponding request message.
1	Credit Control Failure Handling	Optional	This data element contains information used to determine Charging Enabler User action when credit control fails.

Table 9: Debit Units Response message

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7. Flows

In this section, an event charging flow, and session based charging flows are illustrated.

7.1 Event Charging

Event charging flow is used for one time event charging requests, otherwise, session charging will be used.

7.1.1 Immediate Event Charging

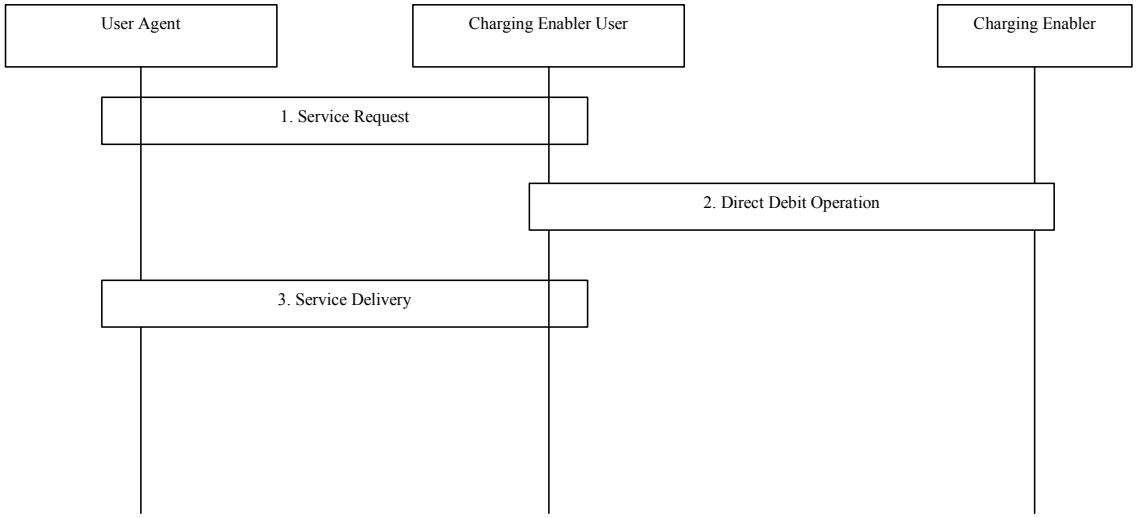

Figure 2: Immediate Event Charging

1. **Service Request:** The user agent requests resource usage from the Charging Enabler User.
2. **Direct Debit Operation:** The operation is used to debit the subscriber's account. The detailed direct debit operation flow can be referred to Section 7.3.1.
3. **Service Delivery:** Service is being delivered.

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7.2 Session Based Charging

7.2.1 Event Charging with Reservation

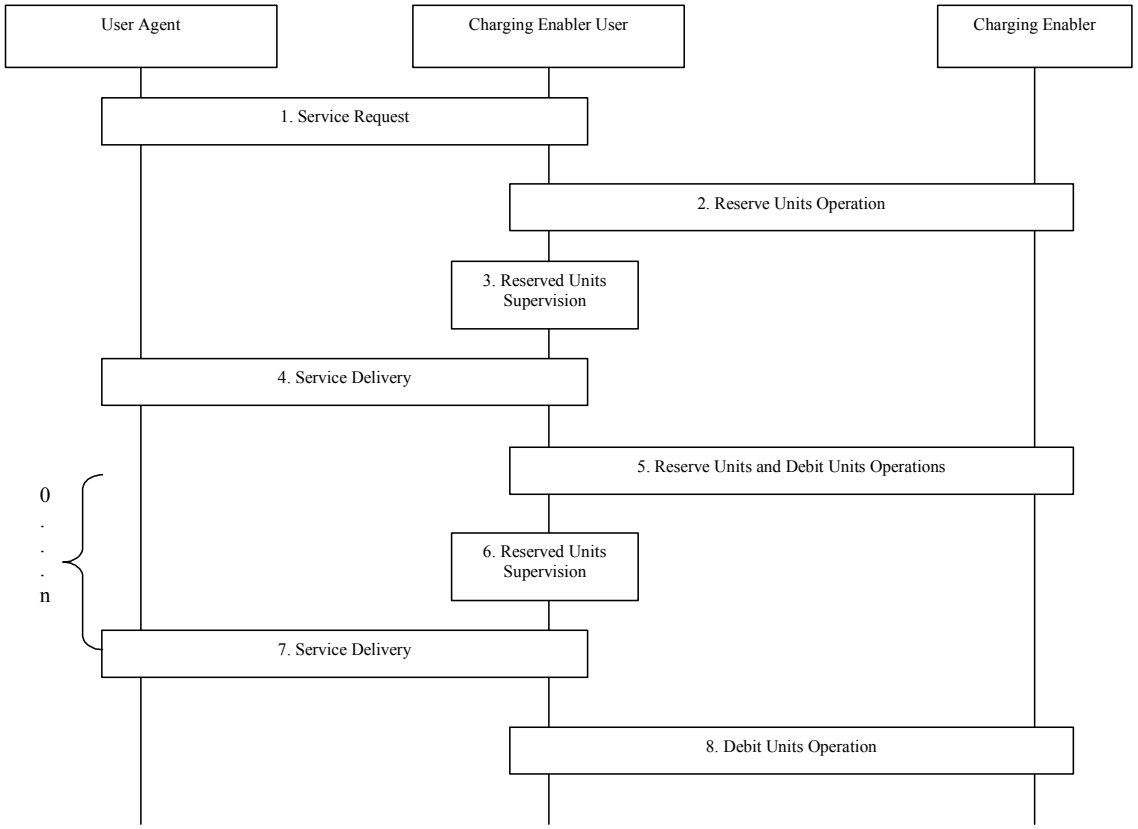

Figure 3: Event Charging with Reservation

1. **Service Request:** The user agent requests resource usage from the Charging Enabler User.
2. **Reserve Units Operation:** The operation is used to reserve service units from the subscriber's account. The detailed reserve units operation flow can be referred to Section 7.3.5.
3. **Reserved Units Supervision:** Simultaneously with the service delivery, the Charging Enabler User monitors the consumption of the reserved units.
4. **Service Delivery:** Service is being delivered.
5. **Reserve Units and Debit Units Operations:** The operations are used to debit the subscriber's account and reserve service units from the subscriber's account. The detailed reserve units and debit units operations flow can be referred to Section 7.3.6.
6. **Reserved Units Supervision:** Simultaneously with the service delivery, the Charging Enabler User monitors the consumption of the reserved units.
7. **Service Delivery:** Service is being delivered. Step 5 to 7 may be repeated zero or several times.
8. **Debit Units Operation:** The operation is used to debit the subscriber's account. The detailed debit units operation flow can be referred to Section 7.3.7.

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7.2.2 Session Charging with Reservation

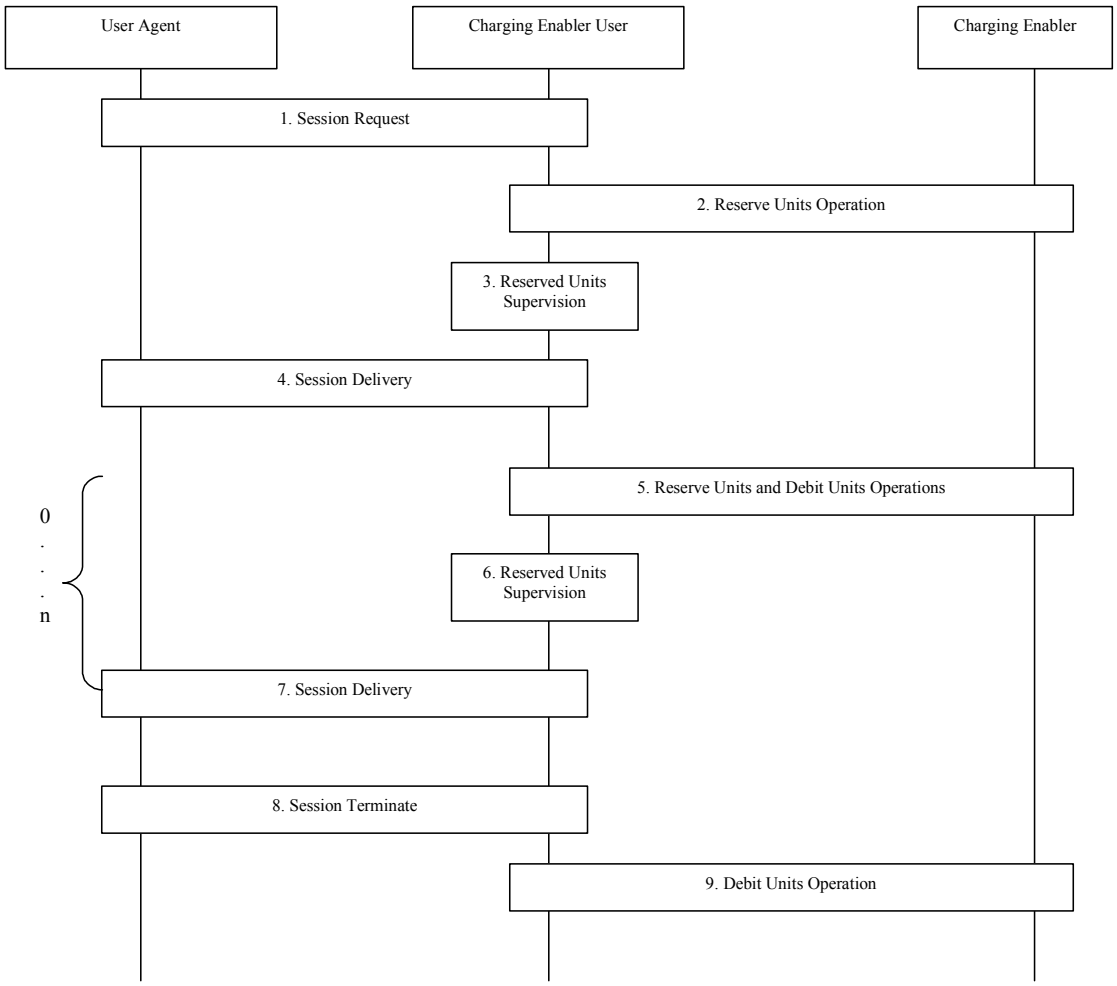

Figure 4: Session Charging with Reservation

1. **Session Request:** The user agent requests resource usage from the Charging Enabler User.
2. **Reserve Units Operation:** The operation is used to reserve service units from the subscriber's account. The detailed reserve units' operation flow can be referred to Section 7.3.5.
3. **Reserved Units Supervision:** Simultaneously with the service delivery, the Charging Enabler User monitors the consumption of the reserved units.
4. **Session Delivery:** Service delivery starts and the reserved units are concurrently controlled.
5. **Reserve Units and Debit Units Operations:** The operations are used to debit the subscriber's account and reserve service units from the subscriber's account. The detailed reserve units and debit units operations flow can be referred to Section 7.3.6.
6. **Reserved Units Supervision:** Simultaneously with the service delivery, the Charging Enabler User monitors the consumption of the reserved units.

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7. **Session Delivery:** Service delivery continues and the reserved units are concurrently controlled. Step 5 to 7 may be repeated zero or several times. The Charging Enabler User delivers the service at once, in fractions or in individually chargeable items, corresponding to the number of granted units.
8. **Session Termination:** The session is terminated at the Charging Enabler User.
9. **Debit Units Operation:** The operation is used to debit the subscriber's account. The detailed debit units operation flow can be referred to Section 7.3.7.

7.3 Primary Action Flow

The complete online charging flow is composed of kinds of primary action flows. This section describes the primary flow to use in online charging.

7.3.1 Direct Debit Operation

The following sections describe the direct debit operation with the various combinations of Unit Determination and rating control between the Charging Enabler User and the Charging Enabler.

7.3.1.1 Decentralized Unit Determination and Centralized Rating

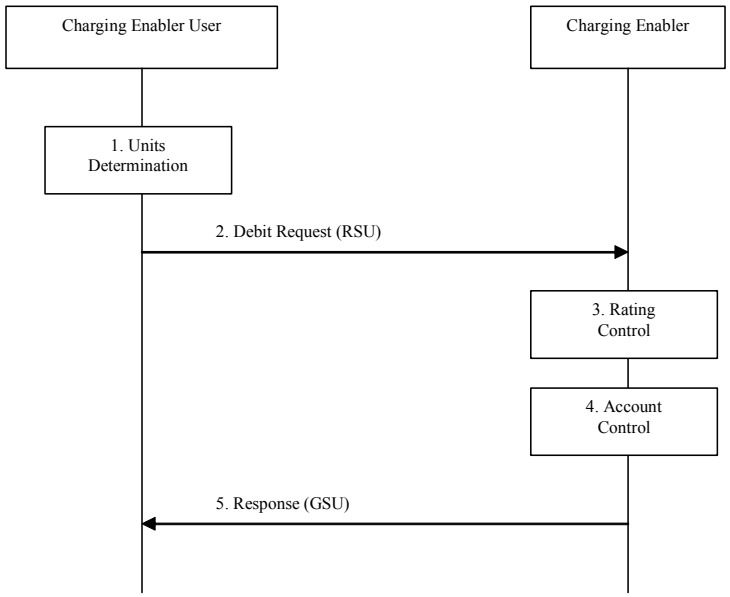

Figure 5: Direct Debit Operation - Decentralized Unit Determination and Centralized Rating

1. **Units Determination:** The Charging Enabler User determines the number of units associating with requested service.
2. **Debit Request:** The Charging Enabler User sends Debit Request with Requested Action set to DIRECT_DEBITING to indicate service specific information to the Charging Enabler. The request message includes Requested Service-Unit (RSU) (service units) indicating the number of units determined.
3. **Rating Control:** Assisted by the rating entity the Charging Enabler calculates the number of monetary units or non-monetary units (e.g. which is expressed in some currency or loyalty points) that represents the price for the number of units requested.
4. **Account Control:** Provided that the user's credit balance is sufficient, the Charging Enabler triggers the deduction of the calculated amount from the subscriber's account.

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5. **Response**: The Charging Enabler returns Response message with Request Type set to EVENT_REQUEST to the Charging Enabler User. The response message includes Granted Service Unit (GSU).

7.3.1.2 Centralized Unit Determination and Centralized Rating

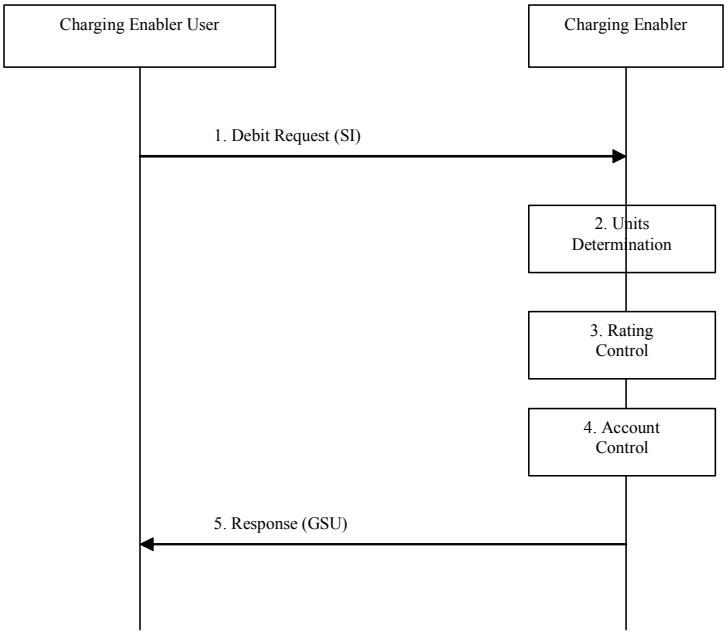

Figure 6: Direct Debit Operation - Centralized Unit Determination and Centralized Rating

1. **Debit Request:** The Charging Enabler User sends Debit Request with Requested Action set to DIRECT_DEBITING to indicate service specific information to the Charging Enabler. The request message includes Service Identifier (SI) indicating the requested service.
2. **Units Determination:** The Charging Enabler determines the number of units associating with requested service.
3. **Rating Control:** Assisted by the rating entity the Charging Enabler calculates the number of monetary units or non-monetary units that represents the price for the number of units determined.
4. **Account Control:** Provided that the user's credit balance is sufficient, the Charging Enabler triggers the deduction of the calculated amount from the subscriber's account.
5. **Response**: The Charging Enabler returns Response message with Request Type set to EVENT_REQUEST to the Charging Enabler User. The response message includes Granted Service Unit (GSU).

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7.3.1.3 Decentralized Unit Determination and Decentralized Rating

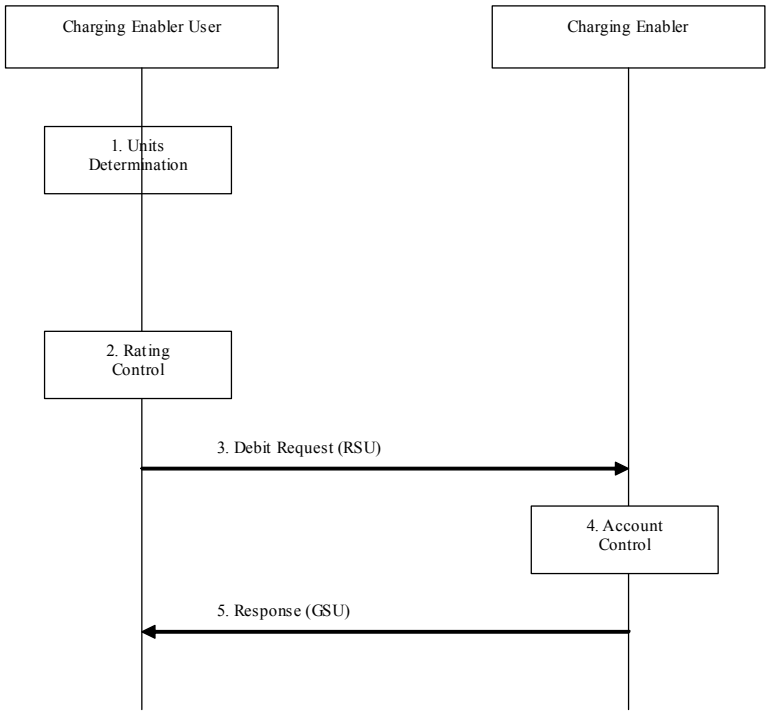

Figure 7: Direct Debit Operation - Decentralized Unit Determination and Decentralized Rating

1. **Units Determination:** The Charging Enabler User determines the number of units associating with requested service.
2. **Rating Control:** Assisted by the rating entity and the price got from Charging Enabler the Charging Enabler User calculates the number of monetary units or non-monetary units that represents the price for the number of units determined.
3. **Debit Request:** The Charging Enabler User sends Debit Request with Requested Action set to DIRECT_DEBITING to indicate service specific information to the Charging Enabler. The request message includes Requested Service Unit (RSU) (monetary units or non-monetary units) indicating the number of units that represents the price.
4. **Account Control:** If the user's credit balance is sufficient, the Charging Enabler triggers the deduction of the calculated amount from the subscriber's account.
5. **Response**: The Charging Enabler returns Response message with Request Type set to EVENT_REQUEST to the Charging Enabler User. The response message includes Granted Service Unit (GSU).

7.3.2 Balance Check Operation

The following sections describe the balance check operation with the various combinations of Unit Determination and rating control between the Charging Enabler User and the Charging Enabler. The Balance Check operation is an optional operation that can be performed after a service request from the end user in any of the flows described in chapter 7. If used, this operation is performed before the Event Request or the Initial Request for a Session is sent from the Charging Enabler User to the Charging Enabler.

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7.3.2.1 Decentralized Unit Determination and Decentralized Rating

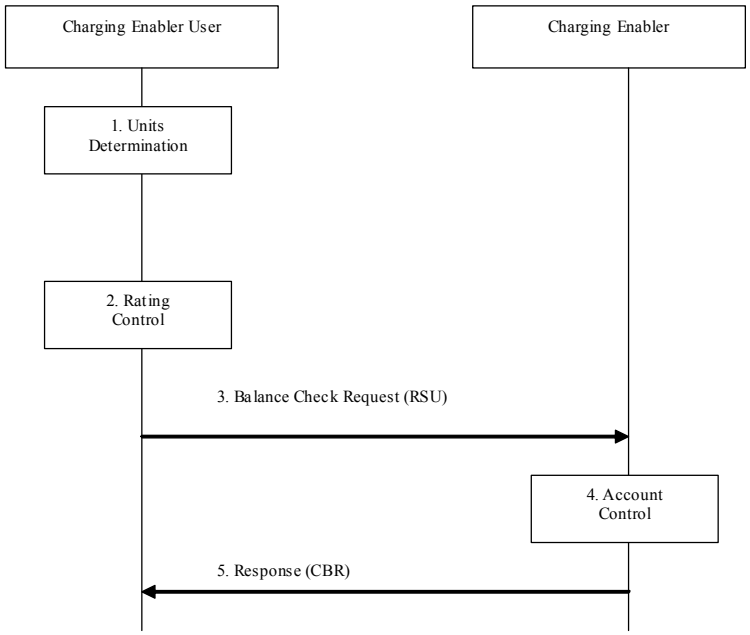

Figure 8: Balance Check Operation - Decentralized Unit Determination and Decentralized Rating

1. **Units Determination:** The Charging Enabler User determines the number of service units associating with requested service.
2. **Rating Control:** Assisted by the rating entity and the price got from Charging Enabler the Charging Enabler User calculates the number of monetary units or non-monetary units that represents the price for the number of units determined.
3. **Balance Check Request:** The Charging Enabler User sends Balance Check Request with Requested Action set to BALANCE_CHECK to indicate service specific information to the Charging Enabler. The request message includes Requested Service Unit (RSU) (monetary units or non-monetary units) indicating the number of units that represents the price.
4. **Account Control:** The Charging Enabler checks whether the user's account balance is sufficient for the requested number of units.
5. **Response:** The Charging Enabler returns Response message with Request Type set to EVENT_REQUEST to the Charging Enabler User. The response message includes Check Balance Result (CBR).

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7.3.2.2 Decentralized Unit Determination and Centralized Rating

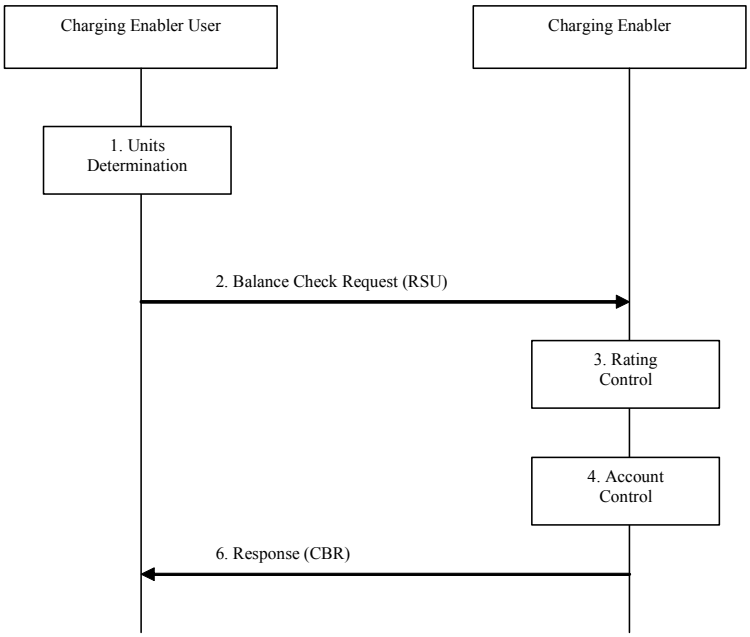

Figure 9: Balance Check Operation - Decentralized Unit Determination and Centralized Rating

1. **Units Determination:** The Charging Enabler User determines the number of service units associating with requested service.
2. **Balance Check Request:** The Charging Enabler User sends Balance Check Request with Requested Action set to BALANCE_CHECK to indicate service specific information to the Charging Enabler. The request message includes Requested Service Unit (RSU) (service units) indicating the number of units associating with requested service.
3. **Rating Control:** Assisted by the rating entity and the price got from Charging Enabler the Charging Enabler User calculates the number of monetary units or non-monetary units that represents the price for the number of units requested.
4. **Account Control:** The Charging Enabler checks whether the user's account balance is sufficient for the number of units calculated by Rating Control.
5. **Response:** The Charging Enabler returns Response message with Request Type set to EVENT_REQUEST to the Charging Enabler User. The response message includes Check Balance Result (CBR).

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7.3.2.3 Centralized Unit Determination and Centralized Rating

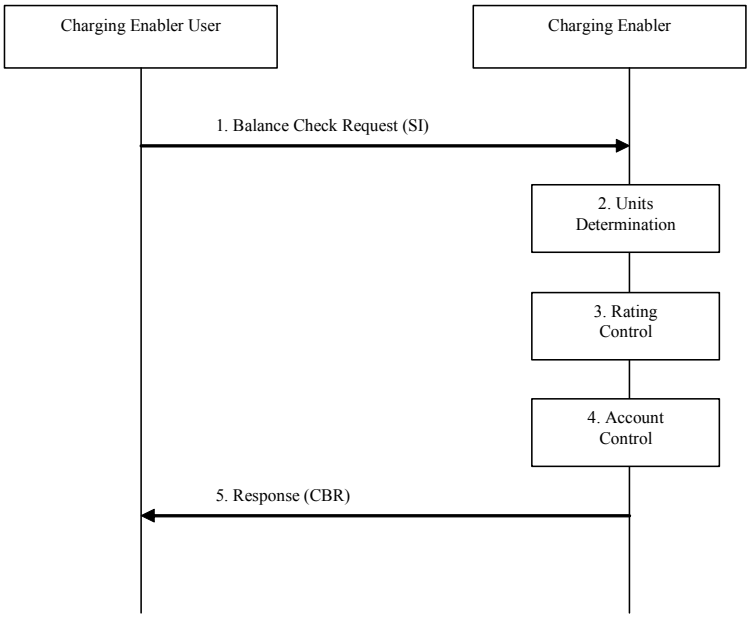

Figure 10: Balance Check Operation - Centralized Unit Determination and Centralized Rating

1. **Balance Check Request:** The Charging Enabler User sends Balance Check Request with Requested Action set to BALANCE_CHECK to indicate service specific information to the Charging Enabler. The request message includes Service Identifier (SI) indicating the requested service.
2. **Units Determination:** The Charging Enabler determines the number of service units associating with requested service.
3. **Rating Control:** Assisted by the rating entity the Charging Enabler calculates the number of monetary units or non-monetary units that represents the price for the number of units determined.
4. **Account Control:** The Charging Enabler checks whether the user's account balance is sufficient for the number of units calculated by Rating Control.
5. **Response:** The Charging Enabler returns Response message with Request Type set to EVENT_REQUEST to the Charging Enabler User. The response message includes Check Balance Result (CBR).

7.3.3 Price Enquiry Operation

The Price Enquiry operation is an optional operation that can be performed after a service request from the end user in any of the flows described in chapter 7. If used, this operation is performed before the Event Request or the Initial Request for a Session is sent from the Charging Enabler User to the Charging Enabler.

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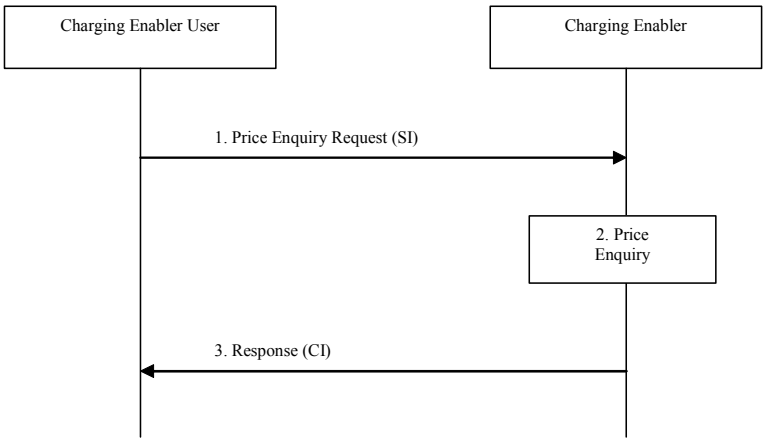

Figure 11: Price Enquiry Operation

1. **Price Enquiry Request:** The Charging Enabler User sends Price Enquiry Request with Requested Action set to PRICE_ENQUIRY to indicate service specific information to the Charging Enabler. The request message includes Service Identifier (SI) indicating the requested service.
2. **Price Enquiry:** The Charging Enabler queries the price of services offered by application service providers. The price can be expressed in monetary or non-monetary units.
3. **Response**: The Charging Enabler returns Response message with Request Type set to EVENT_REQUEST to the Charging Enabler User. The response message includes Cost Information (CI).

7.3.4 Refund Operation

The following sections describe the refund operation with the various combinations of Unit Determination and rating control between the Charging Enabler User and the Charging Enabler.

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7.3.4.1 Decentralized Rating

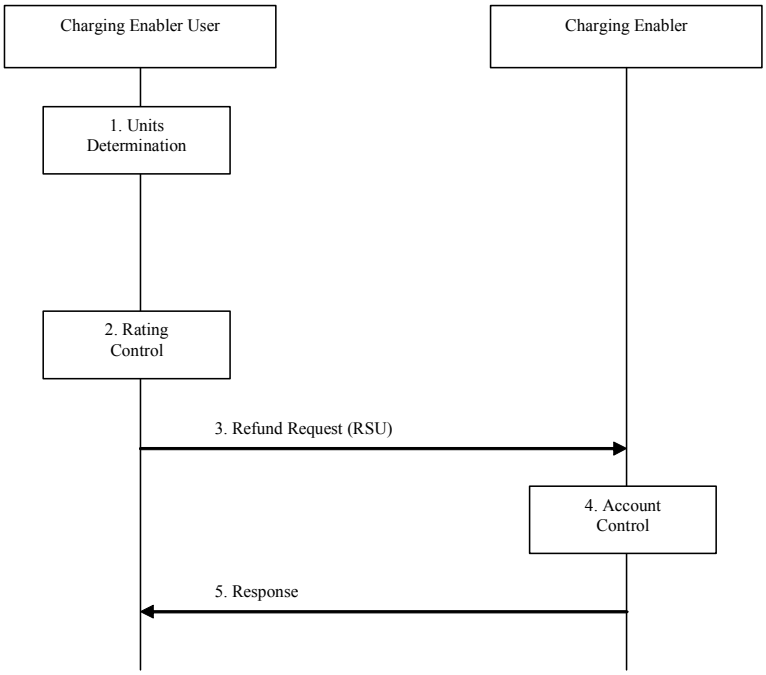

Figure 12: Refund Operation - Decentralized Rating

1. **Units Determination:** The Charging Enabler User determines the number of units associating with requested service.
2. **Rating Control:** Assisted by the rating entity and the price got from Charging Enabler the Charging Enabler User calculates the number of monetary units or non-monetary units that represents the price for the number of units determined.
3. **Refund Request:** The Charging Enabler User sends Refund Request with Requested- Action set to REFUND_ACCOUNT to indicate service specific information to the Charging Enabler. The request message includes Requested -Service -Unit (RSU) (monetary units or non-monetary units) indicating the number of monetary units that represents the price.
4. **Account Control:** The Charging Enabler triggers the addition of the calculated amount to the subscriber's account.
5. **Response**: The Charging Enabler returns Response message with Request Type set to EVENT_REQUEST to the Charging Enabler User. The response message includes Cost Information.

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7.3.4.2 Centralized Rating

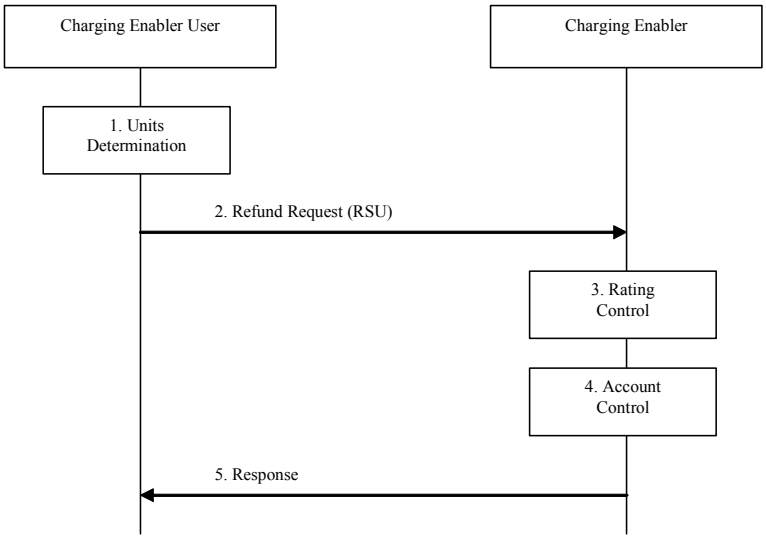

Figure 13: Refund Operation - Centralized Rating

1. **Units Determination:** The Charging Enabler User determines the number of units associating with requested service.
2. **Refund Request:** The Charging Enabler User sends Refund Request with Requested Action set to REFUND_ACCOUNT to indicate service specific information to the Charging Enabler. The request message includes Requested Service -Unit (RSU) (service units) indicating the number of units determined.
3. **Rating Control:** Assisted by the rating entity the Charging Enabler calculates the number of monetary units or non-monetary units that represents the price for the number of units requested.
4. **Account Control: T**he Charging Enabler triggers the addition of the calculated amount to the subscriber's account.
5. **Response**: The Charging Enabler returns Response message with Request -Type set to EVENT_REQUEST to the Charging Enabler User. The response message includes Cost Information.

7.3.5 Reserve Units Operation

The following sections describe the reserve units operation with the various combinations of Unit Determination and rating control between the Charging Enabler User and the Charging Enabler.

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7.3.5.1 Decentralized Unit Determination and Centralized Rating

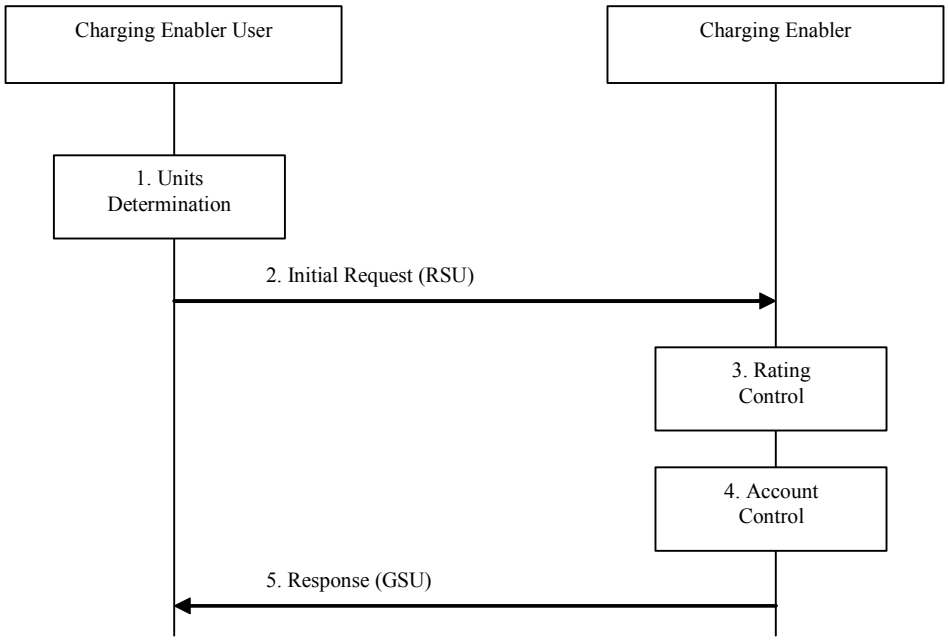

Figure 14: Reserve Units Operation - Decentralized Unit Determination and Centralized Rating

1. **Units Determination:** The Charging Enabler User determines the number of units associating with requested service.
2. **Initial Request:** The Charging Enabler User sends Initial Request with Request Type set to INITIAL_REQUEST to indicate service specific information to the Charging Enabler. The request message includes Requested Service Unit (RSU) (service units) indicating the number of units determined.
3. **Rating Control:** Assisted by the rating entity the Charging Enabler calculates the number of monetary units or non-monetary units that represents the price for the number of units requested.
4. **Account Control:** The Charging Enabler checks whether the user's account balance is sufficient for the requested reservation.

   If the user's account balance is sufficient then the corresponding reservation is made.
5. **Response**: The Charging Enabler returns Response message with Request Type set to INITIAL_REQUEST to the Charging Enabler User. The response message includes Granted Service Unit (GSU).

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7.3.5.2 Centralized Unit Determination and Centralized Rating

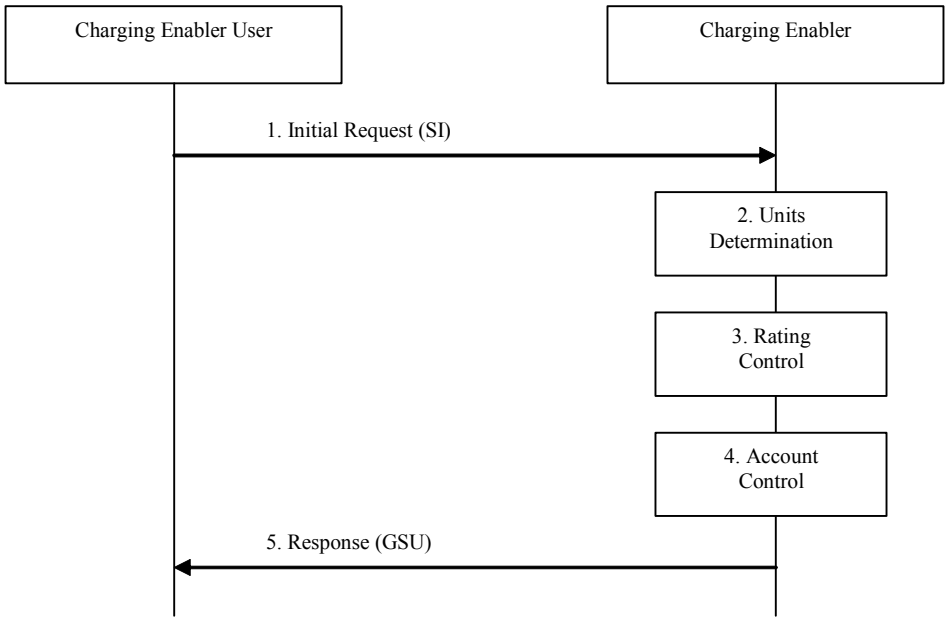

Figure 15: Reserve Units Operation - Centralized Unit Determination and Centralized Rating

1. **Initial Request:** The Charging Enabler User sends Initial Request with Request Type set to INITIAL_REQUEST to indicate service specific information to the Charging Enabler. The request message includes Service Identifier (SI) indicating the requested service.
2. **Units Determination:** The Charging Enabler determines the number of units associating with requested service.
3. **Rating Control:** Assisted by the rating entity the Charging Enabler calculates the number of monetary units or non-monetary units that represents the price for the number of units determined.
4. **Account Control:** The Charging Enabler checks whether the user's account balance is sufficient for the requested reservation.

   If the user's account balance is sufficient then the corresponding reservation is made.
5. **Response**: The Charging Enabler returns Response message with Request Type set to INITIAL_REQUEST to the Charging Enabler User. The response message includes Granted Service Unit (GSU).

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7.3.5.3 Decentralized Unit Determination and Decentralized Rating

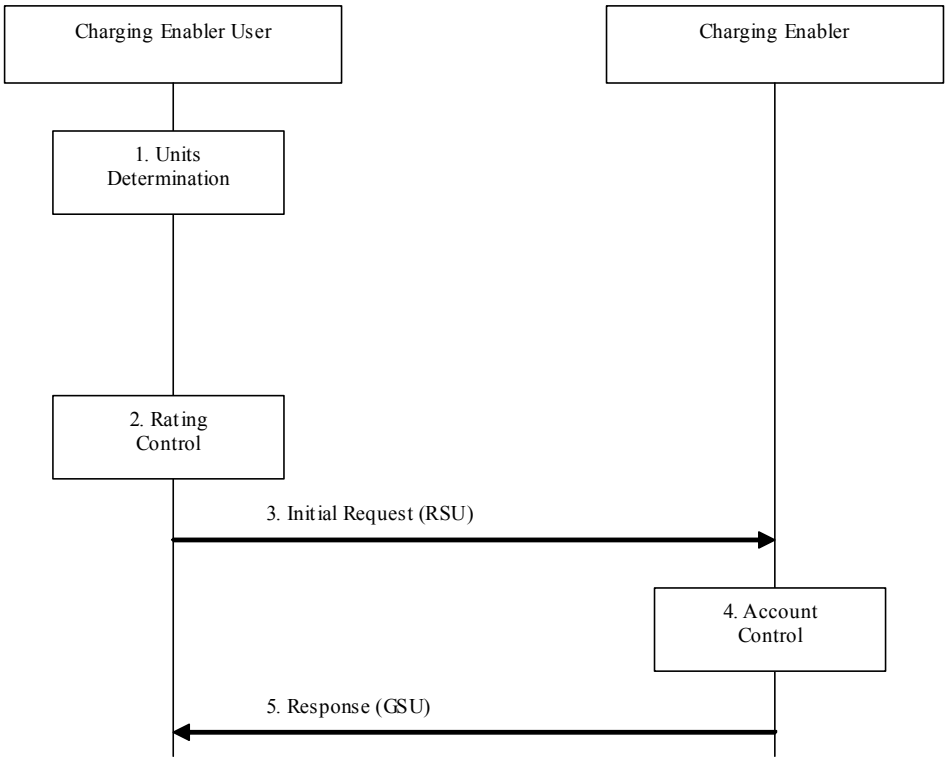

Figure 16: Reserve Units Operation - Decentralized Unit Determination and Decentralized Rating

1. **Units Determination:** The Charging Enabler User determines the number of units associating with requested service.
2. **Rating Control:** Assisted by the rating entity and the price got from Charging Enabler the Charging Enabler User calculates the number of monetary units or non-monetary units that represents the price for the number of units determined.
3. **Initial Request:** The Charging Enabler User sends Initial Request with Request Type set to INITIAL_REQUEST to indicate service specific information to the Charging Enabler. The request message includes Requested Service Unit (RSU) (monetary units or non-monetary units) indicating the number of units that represents the price.
4. **Account Control:** The Charging Enabler checks whether the user's account balance is sufficient for the requested reservation.

   If the user's account balance is sufficient then the corresponding reservation is made.
5. **Response**: The Charging Enabler returns Response message with Request Type set to INITIAL_REQUEST to the Charging Enabler User. The response message includes Granted Service Unit (GSU).

7.3.6 Reserve Units and Debit Units Operations

The following sections describe the reserve units and debit units operations with the various combinations of Unit Determination and rating control between the Charging Enabler User and the Charging Enabler.Decentralized Unit Determination and Centralized Rating.

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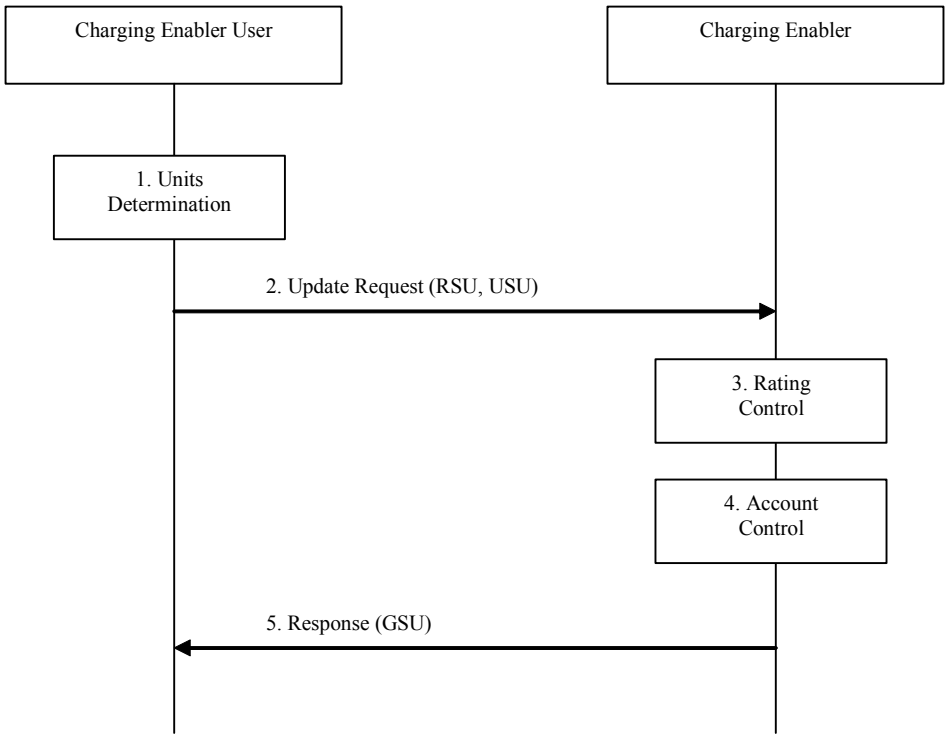

Figure 17: Reserve Units and Debit Units Operations - Decentralized Unit Determination and Centralized Rating

1. **Units Determination:** The Charging Enabler User determines the number of units associating with requested service.
2. **Update Request:** The Charging Enabler User sends Update Request with Request Type set to UPDATE_REQUEST to indicate service specific information to the Charging Enabler. The request message includes Requested Service Unit (RSU) (service units) indicating the number of units determined and Used Service Unit (USU) (service units) indicating the number of units used.
3. **Rating Control:** Assisted by the rating entity the Charging Enabler calculates the number of monetary units or non-monetary that represents the price for the number of units requested and used.
4. **Account Control:** The Charging Enabler triggers the deduction of the calculated amount from the subscriber's account and checks whether the user's account balance is sufficient for the requested reservation.

   If the user's account balance is sufficient then the corresponding reservation is made.
5. **Response:** The Charging Enabler returns Response message with Request Type set to UPDATE_REQUEST to the Charging Enabler User. The response message includes Granted Service Unit (GSU).

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7.3.6.1 Centralized Unit Determination and Centralized Rating

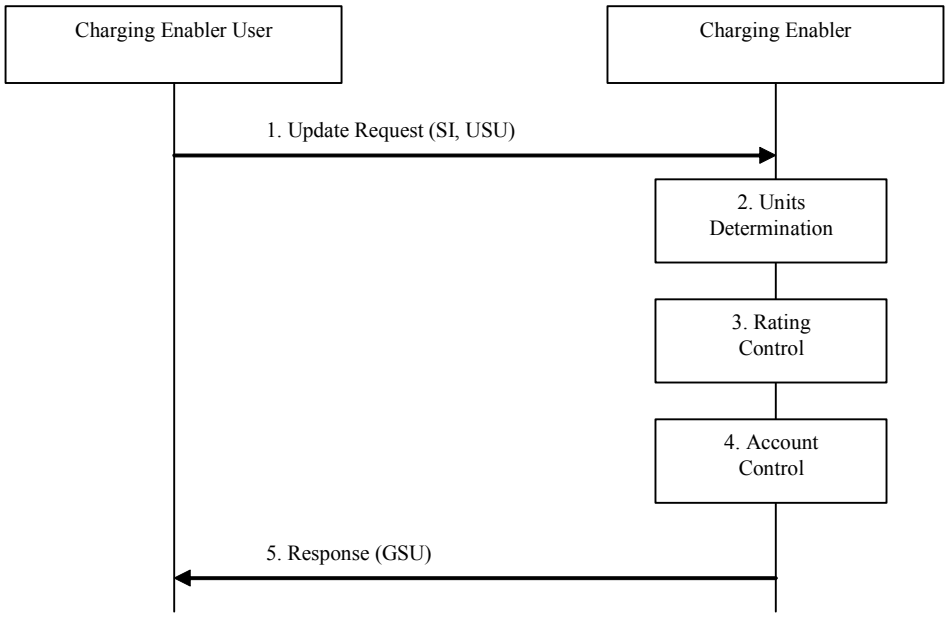

Figure 18: Reserve Units and Debit Units Operations - Centralized Unit Determination and Centralized Rating

1. **Update Request:** The Charging Enabler User sends Update Request with Request Type set to UPDATE_REQUEST to indicate service specific information to the Charging Enabler. The request message includes Service Identifier (SI) indicating the requested service and Used Service Unit (USU) (non service units) indicating the number of units used
2. **Units Determination:** The Charging Enabler determines the number of units associating with requested service.
3. **Rating Control:** Assisted by the rating entity the Charging Enabler calculates the number of monetary units or non-monetary units that represents the price for the number of units determined and used.
4. **Account Control:** The Charging Enabler triggers the deduction of the calculated amount from the subscriber's account and checks whether the user's account balance is sufficient for the requested reservation.

   If the user's credit balance is sufficient, the Charging Enabler triggers the deduction of the calculated amount from the subscriber's account.

   If the user's account balance is sufficient then the corresponding reservation is made.
5. **Response:** The Charging Enabler returns Response message with Request Type set to UPDATE_REQUEST to the Charging Enabler User. The response message includes Granted Service Unit (GSU).

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7.3.6.2 Decentralized Unit Determination and Decentralized Rating

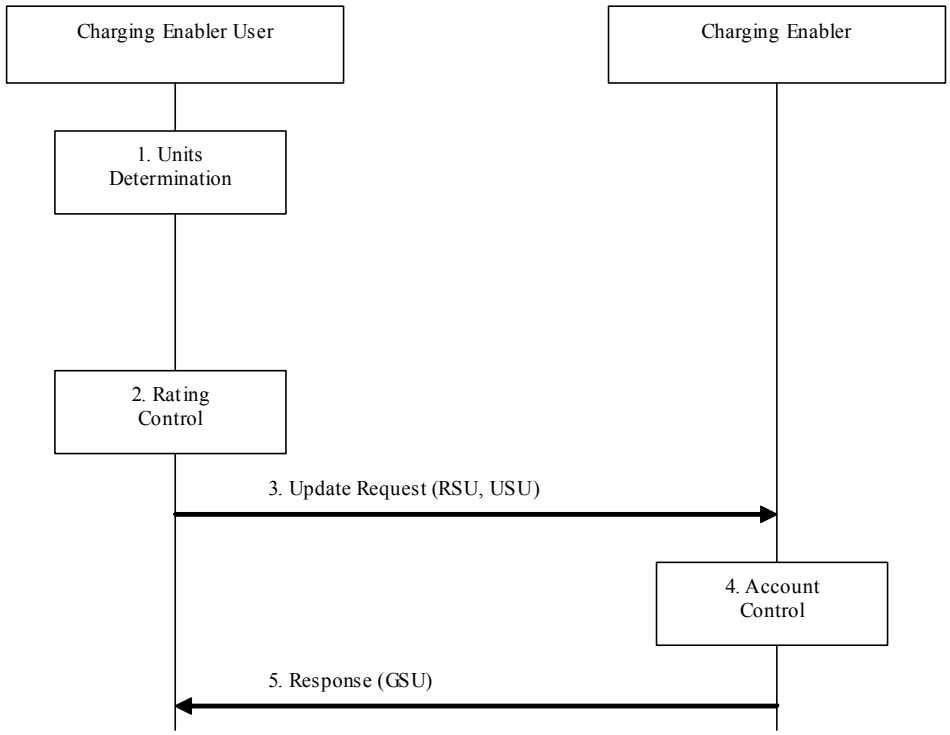

Figure 19: Reserve Units and Debit Units Operations - Decentralized Unit Determination and Decentralized Rating

1. **Units Determination:** The Charging Enabler User determines the number of units associating with requested service.
2. **Rating Control:** Assisted by the rating entity and the price got from Charging Enabler the Charging Enabler User calculates the number of monetary units or non-monetary that represents the price for the number of units requested and used.
3. **Update Request:** The Charging Enabler User sends Update Request with Request Type set to UPDATE_REQUEST to indicate service specific information to the Charging Enabler. The request message includes Requested Service Unit (RSU) (monetary units or non-monetary units) that represents the price for the number of requested units and Used Service Unit (USU) (monetary units or non-monetary units) that represents the price for the number of units used.
4. **Account Control:** The Charging Enabler triggers the deduction of the calculated amount from the subscriber's account and checks whether the user's account balance is sufficient for the requested reservation.

   If the user's account balance is sufficient then the corresponding reservation is made.
5. **Response: T**he Charging Enabler returns Response message with Request Type set to UPDATE_REQUEST to the Charging Enabler User. The response message includes Granted Service Unit (GSU).

7.3.7 Debit Units Operation

The following sections describe the debit units operation with the various combinations of Unit Determination and rating control between the Charging Enabler User and the Charging Enabler.

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7.3.7.1 Centralized Rating

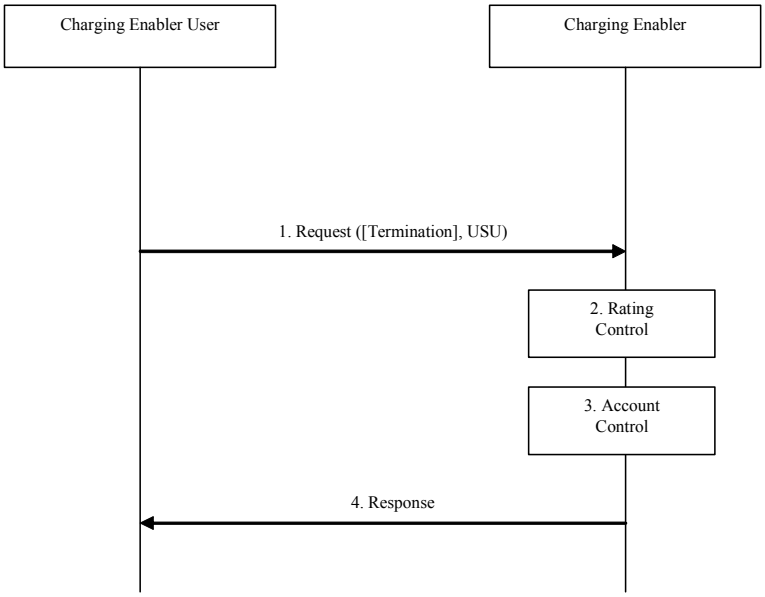

Figure 20: Debit Units Operation - Centralized Rating

1. **Request:** The Charging Enabler User sends Request message with Request Type set to TERMINATION_REQUEST to indicate service specific information to the Charging Enabler. The request message includes Used Service Unit (USU) indicating the number of units used.
2. **Rating Control:** Assisted by the rating entity the Charging Enabler calculates the number of monetary units or non-monetary units that represents the price for the number of requested service units. The rating parameters that determine the price include service parameters and other external parameters.
3. **Account Control:** The Charging Enabler triggers the refunding of the calculated amount from the subscriber's account and the release of the unused units previously reserved but not used.
4. **Response**: The Charging Enabler returns Response message with Request Type set to TERMINATION_REQUEST to the Charging Enabler User.

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7.3.7.2 Decentralized Rating

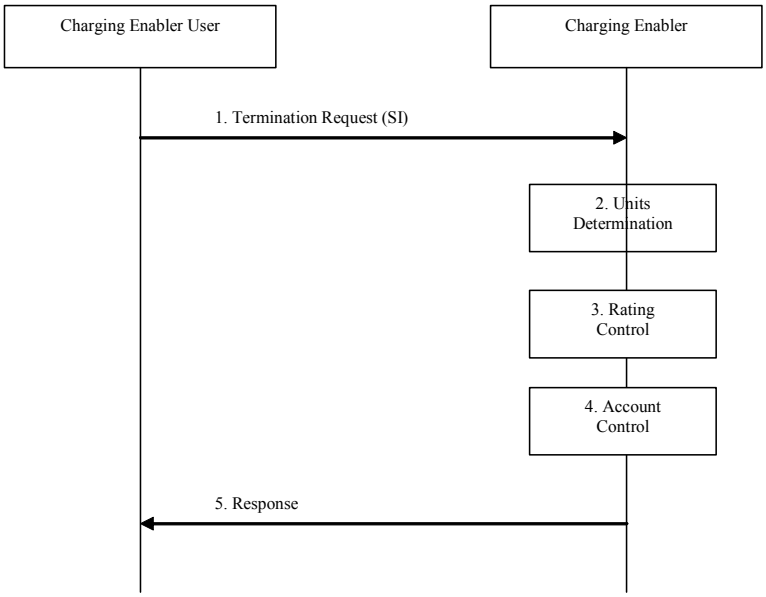

Figure 21: Debit Units Operation - Decentralized Rating

1. **Price Enquiry Operation:** The Charging Enabler User gets the price of the service usage from Charging Enabler. The operation is optional. The detailed price query operation flow can be referred to Section 7.3.3
2. **Rating Control:** Assisted by the rating entity the Charging Enabler User calculates the number of monetary units or non-monetary that represents the price for the number of units used.
3. **Termination Request:** The Charging Enabler User sends Termination Request with Request Type set to TERMINATION_REQUEST to indicate service specific information to the Charging Enabler. The request message includes Service Identifier (SI) indicating the requested service and Used Service Unit (USU) (service units) indicating the number of units used.
4. **Account Control:** The Charging Enabler triggers the deduction of the calculated amount from the subscriber's account, and the release of the unused units previously reserved but not used.
5. **Response**: The Charging Enabler returns Response message with Request Type set to TERMINATION_REQUEST to the Charging Enabler User.

7.4 Exception handling

In the case of the Charging Enabler returning an error code indicating that the user is not available for CH-2 to the Charging Enabler User, the Charging Enabler User may determine to use CH-1.

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8. Bindings of OMA CH-2 Interface to Protocols

This section describes the mapping between the general (protocol independent) messages and Information Elements described in section 6 with the actual protocol(s) and data utilized on the CH-2 charging interface.

8.1 Binding to Diameter

8.1.1 Basic Principles

The Online Charging Interface (CH-2) is based on Diameter Credit-Control Application as specified in [RFC4006]. Any mandatory element of the RFC is supported.

The Diameter client implements the state machine described in [RFC4006] for "CLIENT, EVENT BASED" and/or "CLIENT, SESSION BASED".

The Diameter server implements the state machine described in [RFC4006] for the "SERVER, SESSION AND EVENT BASED" in order to support Event Charging and Session Charging.

With regard to the Diameter protocol the Charging Enabler User acts as the Diameter Client in the sense that it is the entity requesting resource allocation and credit control and the Charging Enabler acts as the Diameter Server in the sense that it is the entity authorizing and allocating credit for resource usage.

In the definition of the Diameter Commands, the AVPs that are specified in the referenced specifications but not used by the OMA Charging Enabler are marked with strikethrough, e.g. ~~[Acct-Multi-Session-Id]~~. If such parameters are present, they will not constitute an error. The bracket convention and the asterisk (*) below are used as in [RFC3588].

8.1.2 Service/Enabler Differentiation

The Online Charging specification is differentiated by a generic part that is applicable to any OMA Online Charging application/enabler and service/enabler specific parts, e.g. for BCAST, IM, etc. The following figure describes the protocol layering architecture.

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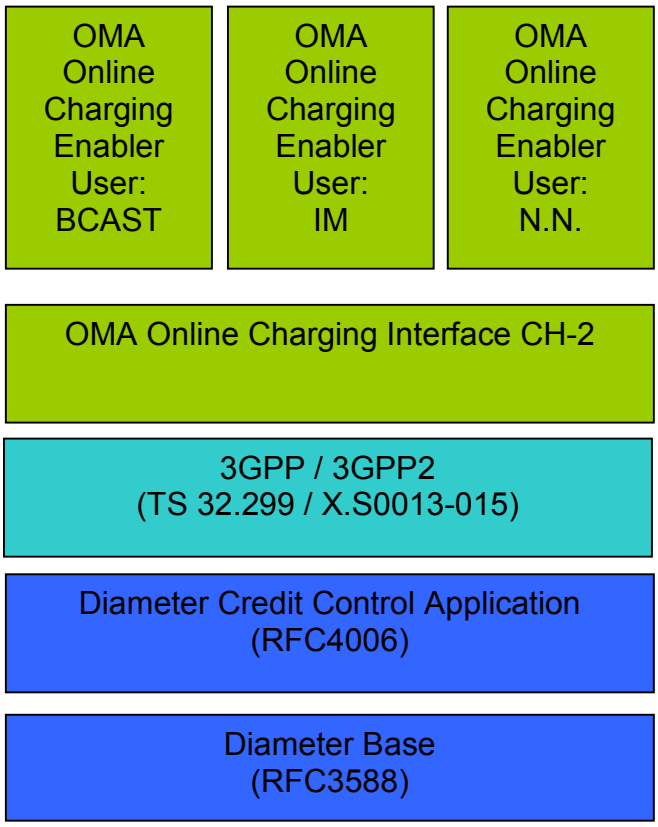

Figure 22: Protocol Layering Architecture

Each protocol layer refines the use of optional protocol elements of the underlying layer and extends it by procedural and specific Diameter protocol elements, the Attribute Value Pairs (AVP). Service/enabler specific documents contain additional protocol elements that may not overlap with each other.

8.1.3 Diameter Messages used on CH-2

As stated in section 6.1, on the CH-2 interface requests are sent from the Charging Enabler User to the Charging Enabler and responses are sent from the Charging Enabler to the Charging Enabler User. The Diameter Credit-Control Request (CCR) messages are used to communicate Event and Session based requests. The Diameter Credit-Control Answer (CCA) messages are used to communicate Events and Session based responses.

The following additional Diameter Base messages as specified in [RFC3588] and inherited by Diameter Credit-Control Application [RFC4006] and shall be supported by the Charging Enabler and Charging Enabler User:

- Re-Auth-Request (RAR) and Re-Auth-Answer (RAA);
- Capability-Exchange-Request (CER) and Capability-Exchange-Answer (CEA);
- Device-Watchdog-Request (DWR) and Device-Watchdog-Answer (DWA);
- Abort-Session-Request (ASR) and Abort-Session-Answer (ASA);
- Disconnect-Peer-Request (DPR) and Disconnect-Peer-Answer (DPA).

8.1.3.1 Credit-Control Request Command

The CCR command is sent from the Charging Enabler User to the Charging Enabler in order to request credit authorization for resource usage. This command is used for both Event Based and Session Based requests. The distinction is made accordingly to the value carried in the CC-Request-Type AVP: EVENT_REQUEST (value 4) for an Event Based request,

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INITIAL_REQUEST (value 1), UPDATE_REQUEST (value 2) and TERMINATION_REQUEST (value 3) for a Session Based request.

The message format is the following:

<Credit-Control-Request> ::= < Diameter Header: 272, REQ, PXY >

< Session-Id >
{ Origin-Host }
{ Origin-Realm }
{ Destination-Realm }
{ Auth-Application-Id }
{ Service-Context-Id }
{ CC-Request-Type }
{ CC-Request-Number }
[Destination-Host]
[User-Name]
~~[CC-Sub-Session-Id]~~
~~[Acct-Multi-Session-Id]~~
[Origin-State-Id]
[Event-Timestamp]
*[Subscription-Id]
~~[Service-Identifier]~~
[Termination-Cause]
~~[Requested-Service-Unit]~~
[Requested-Action]
~~*[Used-Service-Unit]~~
[Multiple-Services-Indicator]
*[Multiple-Services-Credit-Control]
~~*[Service-Parameter-Info]~~
~~[CC-Correlation-Id]~~
[User-Equipment-Info]
*[Proxy-Info]
*[Route-Record]
[Service-Information]
*[AVP]

8.1.3.2 Credit-Control Answer Command

The CCA commandis sent from the Charging Enabler to the Charging Enabler User in response to a CCR command and is used in order to authorize and allocate credit for resource usage. This command is used for both Event Based and Session Based responses. The distinction is made accordingly to the value carried in the CC-Request-Type AVP. The value of this AVP will be the same one contained in the same AVP of the corresponding request.

The message format is the following:

<Credit-Control-Answer> ::= < Diameter Header: 272, PXY >

< Session-Id >
{ Result-Code }
{ Origin-Host }
{ Origin-Realm }
{ Auth-Application-Id }
{ CC-Request-Type }

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{ CC-Request-Number }
[User-Name]
[CC-Session-Failover]
[CC-Sub-Session-Id]
[Acct-Multi-Session-Id]
[Origin-State-Id]
[Event-Timestamp]
[Granted-Service-Unit]
*[Multiple-Services-Credit-Control]
[Cost-Information]
[Final-Unit-Indication]
[Check-Balance-Result]
[Credit-Control-Failure-Handling]
[Direct-Debiting-Failure-Handling]
[Validity-Time]
*[Redirect-Host]
[Redirect-Host-Usage]
[Redirect-Max-Cache-Time]
*[Proxy-Info]
*[Route-Record]
*[Failed-AVP]
*[AVP]

8.1.4 Mapping of OMA Data Elements to AVPs

The following table describes the mapping of the OMA Charging Data Elements to the Diameter AVPs, which are re-used from [RFC3588], [RFC4005], [RFC4006] or [TS32.299]. Mapping of OMA Charging Data Elements to AVPs defined by OMA can be found from [OMNA].

OMA Charging Data Element	Diameter AVP
Input Octets	CC-Input-Octets
Money	CC-Money
Output Octets	CC-Output-Octets
Request Number	CC-Request-Number
Request Type	CC-Request-Type
Service Specific Units	CC-Service-Specific-Units
Session Failover	CC-Session-Failover
Time	CC-Time
Total Octets	CC-Total-Octets
Check Balance Result	Check-Balance-Result
Cost Information	Cost-Information
Cost Unit	Cost-Unit
Credit Control Failure Handling	Credit-Control-Failure-Handling
Currency Code	Currency-Code
Destination Host	Destination-Host
Destination Realm	Destination-Realm
Event Timestamp	Event-Timestamp
Exponent	Exponent
Granted Service Unit	Granted-Service-Unit
Multiple Services Credit Control	Multiple-Services-Credit-Control

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OMA Charging Data Element	Diameter AVP
Multiple Service Indicator	Multiple-Services-Indicator
Origin Host	Origin-Host
Origin Realm	Origin-Realm
Origin State Id	Origin-State-Id
Requested Action	Requested-Action
Requested Service Unit	Requested-Service-Unit
Result Code	Result-Code
Service Context Id	Service-Context-Id
Service Identifier	Service-Identifier
Service Information	Service-Information
Session Id	Session-Id
Subscription Id	Subscription-Id
Subscription Id Data	Subscription-Id-Data
Subscription Id Type	Subscription-Id-Type
Correlation Id	[OMNA]
Service Key	[OMNA]
Service Generic Information	[OMNA]
Termination Cause	Termination-Cause
Unit Value	Unit-Value
Used Service Unit	Used-Service-Unit
User Equipment Info	User-Equipment-Info
User Equipment Info Type	User-Equipment-Info-Type
User Equipment Info Value	User-Equipment-Info-Value
Value Digits	Value-Digits

Table 10: Mapping from OMA Charging Data Elements to Diameter Credit Control AVPs

8.1.5 Summary of AVPs used on CH-2

The following table lists the Diameter AVPs specifically re-used by OMA for the Online Charging interface (CH-2).

The table contains the following information:

- AVP Name: The name used in Diameter.
- AVP Code: The AVP Code used in the Diameter AVP Header.
- Used in CCR: Indicates if it is mandatory, optional or not used in the CCR command.
- Used in MSCC CCR: Indicates if it is mandatory, optional or not used in the Multiple Services Credit Control parameter in the CCR command.
- Used in CCA: Indicates if it is mandatory, optional or not used in the CCA command.
- Used in MSCC CCA: Indicates if it is mandatory, optional or not used in the Multiple Services Credit Control parameter in the CCA command.
- AVP Defined: A reference to where this AVP is defined.
- Value Type: The Diameter format of the AVP data as defined in Basic or Derived AVP Data Format.
- AVP Flag Rules: The rules for how the AVP Flags in the AVP Header may be set.
- May Encr.: Indicates if the AVP may be encrypted or not.

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AVP Name	AVP Code	Used in				AVP defined	Value Type	AVP Flag rules				May Encr.
		CCR	CCR MSCC	CCA	CCA MSCC			Must	May	Should not	Must not	
Auth-Application-Id	258	M	-	M	-	[RFC3588]	Unsigned32	M	P	-	V	N
CC-Input-Octets	412	-	O	-	O	[RFC4006]	Unsigned64	-	P,M	-	V	Y
CC-Money	413	-	O	-	O	[RFC4006]	Grouped	M	P	-	V	Y
CC-Output-Octets	414	-	O	-	O	[RFC4006]	Unsigned64	M	P	-	V	Y
CC-Request-Number	415	M	-	M	-	[RFC4006]	Unsigned32	M	P	-	V	Y
CC-Request-Type	416	M	-	M	-	[RFC4006]	Enumerated	M	P	-	V	Y
CC-Service-Specific-Units	417	-	O	-	O	[RFC4006]	Unsigned64	M	P	-	V	Y
CC-Session-Failover	418	-	-	O	-	[RFC4006]	Enumerated	M	P	-	V	Y
CC-Time	420	-	O	-	O	[RFC4006]	Unsigned32	M	P	-	V	Y
CC-Total-Octets	421	-	O	-	O	[RFC4006]	Unsigned64	M	P	-	V	Y
Check-Balance-Result	422	-	-	O	-	[RFC4006]	Enumerated	M	P	-	V	Y
Cost-Information	423	-	-	O	-	[RFC4006]	Grouped	M	P	-	V	Y
Cost-Unit	424	-	-	-	O	[RFC4006]	UTF8String	M	P	-	V	Y
Credit-Control-Failure-Handling	427	-	-	O	-	[RFC4006]	Enumerated	M	P	-	V	Y
Currency-Code	425	-	M	-	M	[RFC4006]	Unsigned32	M	P	-	V	Y
Destination-Host	293	O	-	-	-	[RFC4006]	DiamIdent	M	P	-	V	N
Destination-Realm	283	M	-	-	-	[RFC4006]	DiamIdent	M	P	-	V	N
Event-Timestamp	55	O	-	O	-	[RFC3588]	Time	M	P	-	V	N
Exponent	429	-	O	-	O	[RFC4006]	Integer32	M	P	-	V	Y
Failed-AVP	279	-	-	O	-	[RFC3588]	Grouped	M	P	-	V	N
Final-Unit-Action	449	-	-	O	-	[RFC4006]	Enumerated	M	P	-	V	Y
Final-Unit-Indication	430	-	-	O	-	[RFC4006]	Grouped	M	P	-	V	Y
Granted-Service-Unit	431	-	-	-	O	[RFC4006]	Grouped	M	P	-	V	Y
Multiple-Services-Credit-Control	456	O	-	O	-	[RFC4006]	Grouped	M	P	-	V	Y
Multiple-Services-Indicator	455	O	-	O	-	[RFC4006]	Enumerated	M	P	-	V	Y
Origin-Host	264	M	-	M	-	[RFC3588]	DiamIdent	M	P	-	V	N
Origin-Realm	296	M	-	M	-	[RFC3588]	DiamIdent	M	P	-	V	N
Origin-State-Id	278	O	-	-	-	[RFC3588]	Unsigned32	M	P	-	V	Y
Proxy-Info	284	O	-	O	-	[RFC3588]	Grouped	M	-	-	P,V	N
Proxy-Host	280	M	-	M	-	[RFC3588]	DiamIdent	M	-	-	P,V	N
Proxy-State	33	M	-	M	-	[RFC3588]	OctetString	M	-	-	P,V	N
Quota-Consumption-Time	881	-	-	-	O	[TS32.299]	Unsigned32	V,M	P	-	-	N
Quota-Holding-Time	871	-	-	-	O	[TS32.299]	Unsigned32	V,M	P	-	-	N
Rating-Group	432	O	O	O	O	[RFC4006]	Unsigned32	M	P	-	V	Y
Redirect-Address-Type	433	M	-	M	-	[RFC4006]	Enumerated	M	P	-	V	Y
Redirect-Host	292	-	-	O	-	[RFC3588]	DiamURI	M	P	-	V	N
Redirect-Host-Usage	261	-	-	O	-	[RFC3588]	Enumerated	M	P	-	V	N
Redirect-Max-Cache-Time	262	-	-	O	-	[RFC3588]	Unsigned32	M	P	-	V	N

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AVP Name	AVP Code	Used in				AVP defined	Value Type	AVP Flag rules				May Encr.
		CCR	CCR MSCC	CCA	CCA MSCC			Must	May	Should not	Must not	
Redirect-Server	434	-	-	O	-	[RFC4006]	Grouped	M	P	-	V	Y
Redirect-Server-Address	435	-	-	M	-	[RFC4006]	UTF8String	M	P	-	V	Y
Reporting-Reason	872	-	O	-	-	[TS32.299]	Enumerated	V,M	P	-	-	N
Requested-Action	436	O	-	-	-	[RFC4006]	Enumerated	M	P	-	V	Y
Requested-Service-Unit	437	-	O	-	-	[RFC4006]	Grouped	M	P	-	V	Y
Restriction-Filter-Rule	438	-	-	O	-	[RFC4006]	IPFilterRule	M	P	-	V	Y
Result-Code	268	-	-	M	O	[RFC3588]	Unsigned32	M	P	-	V	N
Route-Record	282	O	-	O	-	[RFC3588]	DiamIdent	M	-	-	P,V	N
Service-Context-Id	461	M	-	-	-	[RFC4006]	UTF8String	M	P	-	V	Y
Service-Identifier	439	-	O	-	O	[RFC4006]	UTF8String	M	P	-	V	Y
Service-Information	873	O	-	O	-	[TS32.299]	Grouped	V,M	P	-	-	N
Session-Id	263	M	-	M	-	[RFC3588]	UTF8String	M	P	-	V	Y
Subscription-Id	443	O	-	-	-	[RFC4006]	Grouped	M	P	-	V	Y
Subscription-Id-Data	444	M	-	-	-	[RFC4006]	UTF8String	M	P	-	V	Y
Subscription-Id-Type	450	M	-	-	-	[RFC4006]	Enumerated	M	P	-	V	Y
Tariff-Change-Usage	452	O	-	-	-	[RFC4006]	Enumerated	M	P	-	V	Y
Tariff-Time-Change	451	-	-	O	-	[RFC4006]	Time	M	P	-	V	Y
Termination-Cause	295	O	-	-	-	[RFC3588]	Enumerated	M	P	-	V	N
Time-Quota-Threshold	868	-	-	-	O	[TS32.299]	Unsigned64	V,M	P	-	-	N
Trigger-Type	870	-	O	-	O	[TS32.299]	Enumerated	V,M	P	-	-	N
Unit-Value	445	-	M	-	M	[RFC4006]	Grouped	M	P	-	V	Y
Used-Service-Unit	446	-	O	-	-	[RFC4006]	Grouped	M	P	-	V	Y
User-Equipment-Info	458	O	-	-	-	[RFC4006]	Grouped	-	P,M	-	V	Y
User-Equipment-Info-Type	459	M	-	-	-	[RFC4006]	Enumerated	-	P,M	-	V	Y
User-Equipment-Info-Value	460	M	-	-	-	[RFC4006]	OctetString	-	P,M	-	V	Y
User-Name	1	O	-	-	-	[RFC3588]	UTF8String	M	P	-	V	Y
Validity-Time	448	-	-	-	O	[RFC4006]	Unsigned32	M	P	-	V	Y
Value-Digits	447	-	M	-	M	[RFC4006]	Integer64	M	P	-	V	Y
Volume-Quota-Threshold	869	-	-	-	O	[TS32.299]	Unsigned64	V,M	P	-	-	N

Table 11: Summary of AVPs used on CH-2

OMA specific AVP usage is described in the following subsections.

8.1.5.1 Auth-Application-Id AVP

Since the protocol used on CH-2 is Diameter Credit Control, this AVP shall contain the value of 4 as defined in [RFC4006].

8.1.5.2 Multiple-Services-Credit-Control AVP

The *Multiple-Services-Credit-Control* AVP (AVP code 456) is of type grouped as specified in [RFC4006]. It contains additional 3GPP specific charging parameters.

It has the following ABNF grammar:

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```
<Multiple-Services-Credit-Control> ::=    < AVP Header: 456 >
                                           [ Granted-Service-Unit ]
                                           [ Requested-Service-Unit ]
                                          *[ Used-Service-Unit ]
                                           [ Tariff-Change-Usage ]
                                          *[ Service-Identifier ]
                                           [ Rating-Group ]
                                          *[ G-S-U-Pool-Reference ]
                                           [ Validity-Time ]
                                           [ Result-Code ]
                                           [ Final-Unit-Indication ]
                                           [ Time-Quota-Threshold ]
                                           [ Volume-Quota-Threshold]
                                           [ Quota-Holding-Time ]
                                           [ Quota-Consumption-Time ]
                                          *[ Reporting-Reason ]
                                          *[ Trigger-Type ]
                                          *[ AVP ]
```

8.1.5.3 Service-Context-Id AVP

This AVP is of type UTF8String and contains a unique identifier of the Diameter credit-control service specific document that applies to the request. This is an identifier allocated by the service provider, by the service element manufacturer, or by a standardization body, and must uniquely identify a given Diameter credit-control service specific document.

The format of the Service-Context-Id is:

"extensions"."Release"."service-context" "@" "domain"

The OMA specific value for “domain” is “openmobilealliance.org”. The OMA specific values for the "service-context" SHALL be derived from the service enabler names. The service enabler MAY use the "Release" to indicate the OMA Release of the enabler e.g. “1” for version 1.0. Extensions MAY be used to indicate a sub-release or to indicate other implementation details as required.

Example:

- For BCAST charging: BCAST@openmobilealliance.org
- For IM charging: IM@openmobilealliance.org

8.1.5.4 Service-Information AVP

The Service-*Information* AVP (AVP code 873) is of type Grouped. Its purpose is to allow the transmission of additional OMA service/enabler specific information elements which are described in service/enabler specific documents.

The complete ABNF syntax is defined in [TS32.299]. OMA specific extensions are listed in [OMNA].

The format and content of the fields inside the OMA specific Service-Information AVP are specified in the documents which are applicable for the specific service/enabler. Note that the formats of the fields are service/enabler-specific, i.e. the format will be different for the various services/enablers.

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Appendix A. Change History (Informative)

A.1 Approved Version History

Reference	Date	Description
n/a	n/a	No prior version

A.2 Draft/Candidate Version 1.0 History

Document Identifier	Date	Sections	Description
Draft Versions OMA-TS-Online-Charging-Interface_V1_0	13 Dec 2005	Whole document.	This version includes the following agreed ICs' submitted to the Athens meeting. This can be now considered the latest baseline to the online specification and supersedes OMA-MCC-2005-0286R02-OMA-TS-Online-Charging-Interface_V1_0-20051215. OMA-MCC-2005-0270 OMA-MCC-2005-0276R01 OMA-MCC-2005-0278R01 OMA-MCC-2005-0279 OMA-MCC-2005-0280R01 OMA-MCC-2005-0282R01 OMA-MCC-2005-0285 OMA-MCC-2005-0289 OMA-MCC-2005-0291R01 OMA-MCC-2005-0292 OMA-MCC-2005-0298R01 OMA-MCC-2005-0299R01 OMA-MCC-2005-0300
	19 Jan 2006	-	One correction copied twice has been corrected. AVPs have been deleted from the main section 6.
Draft Versions OMA-TS-Online_Charging_Interface_V1_0	29 Mar 2006		The following agreed contributions are included: OMA-MCC-2005-0301 OMA-MCC-2005-0304R01 OMA-MCC-2005-0305 OMA-MCC-2006-0002 OMA-MCC-2006-0004R01 OMA-MCC-2006-0008
			OMA-MCC-2006-0047R01 OMA-MCC-2006-0048R01 OMA-MCC-2006-0051 OMA-MCC-2006-0056R01 OMA-MCC-2006-0058 OMA-MCC-2006-0059R01 OMA-MCC-2006-0062 OMA-MCC-2006-0065R01 OMA-MCC-2006-0069R01 Editorial and formatting changes proposed by DSO. Other minor editorial and formatting changes by the editor.
	05 Apr 2006	6.1, 6.3.7.2 (now 7.3.7.2), 7.3.4.1, 7.3.4.2, 7.3.7.1, 7.4, 8.3.2, App. B	The following agreed contributions are included: OMA-MCC-2006-0075R02 OMA-MCC-2006-0081 OMA-MCC-2006-0084R01 OMA-MCC-2006-0088R01 OMA-MCC-2006-0100R01 OMA-MCC-2006-0065R01 (a few changes had been omitted from last update) OMA-MCC-2006-0102

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Document Identifier	Date	Sections	Description
Draft Versions OMA-TS-Online_Charging_Interface_V1_0	07 Apr 2006	 3.2, 7.3.2 6.2 6.1, 8.2.1 6.2, 8.2.2 8.3 8	The following agreed contributions are included: OMA-MCC-2006-0108 OMA-MCC-2006-0109R01 OMA-MCC-2006-0110R01 OMA-MCC-2006-0111R01 OMA-MCC-2006-0114R02 OMA-MCC-2006-0115
	17 May 2006	6.1, 8.1.3.1, 8.1.4.4, 7.1.1	OMA-MCC-2006-0125R01 OMA-MCC-2006-0128R01
Draft Version OMA-TS-Charging_Online-V1_0	25 Aug 2006	All	Incorporation of a Class 3 CR forgotten in previous update: OMA-MCC-2006-0117 (section 8.1.5). Updated in line with review comments CH2-002 and CH2-003 (see OMA-CONRR-Charging-V1_0-20060608-D). Inorporation of CR OMA-MCC-2006-0152R01 (resolving comments CH2-003, CH2-004, CH2-005, CH2-006) Inorporation of CR OMA-MCC-2006-0188 (resolving comment CH2-001) Document name changed to OMA-TS-Charging_Online-V1_0 (review comment TS-001). Editorial changes to defined terms through out document, to ensure consistency with the other documents in the ERP. Incorporation of one Class 2 CR: OMA-MCC-2006-0177R01
Candidate Version OMA-TS-Charging_Online-V1_0	26 Sep 2006	n/a	Status changed to Candidate by TP: TP ref. # OMA-TP-2006-0305-INP_Charging_V1_0_ERP_for_Candidate_Approval

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Appendix B. Static Conformance Requirements (Normative)

The notation used in this appendix is specified in [IOPPROC].

B.1 SCR for the Charging Enabler User

B.1.1 Generic SCR

Item	Function	Reference	Status	Requirement
OMA-MCC-C-001	Implement the state machine for the "CLIENT, SESSION BASED"	[RFC4006] Section 7	M	
OMA-MCC-C-002	Implement the state machine for the "CLIENT, EVENT BASED"	[RFC4006] Section 7	M	
OMA-MCC-C-003	Error handling is dealt with as specified in the Diameter Base Protocol	[RFC3558] Section 7	M	
OMA-MCC-C-004	Error handling is dealt with as specified in the Diameter Credit Control specification	[RFC4006] Section 9	M	
OMA-MCC-C-005	Session Based Credit-Control failure procedures are compliant with Diameter specifications	[RFC4006] Section 5.7	M	
OMA-MCC-C-006	One Time Event failure procedure is compliant with Diameter specifications	[RFC4006] Section 6.5	M	

B.1.2 Event Charging

Item	Function	Reference	Status	Requirement
OMA-MCC-C-007	Support Direct debit request	Section 6.1.1.1	M	
OMA-MCC-C-008	Support Balance check request	Section 6.1.1.2	O	
OMA-MCC-C-009	Support Refund request	Section 6.1.1.3	O	
OMA-MCC-C-010	Support Price enquiry Request	Section 6.1.1.4	O	

B.1.3 Session Charging

Item	Function	Reference	Status	Requirement
OMA-MCC-C-011	Support Initial request	Section 6.1.2.1	M	
OMA-MCC-C-012	Support Update request	Section 6.1.2.2	O	
OMA-MCC-C-013	Support Termination request	Section 6.1.2.3	M	

B.2 SCR for the Charging Enabler

B.2.1 Generic SCR

Item	Function	Reference	Status	Requirement
OMA-MCC-S-001	Implement the state machine for the "SERVER, SESSION AND EVENT BASED"	[RFC4006] Section 7	M	
OMA-MCC-S-002	Error handling is dealt with as specified in the Diameter Base Protocol	[RFC3558] Section 7	M	
OMA-MCC-S-003	Error handling is dealt with as specified in the Diameter Credit Control specification	[RFC4006] Section 9	M	

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B.2.2 Event Charging

Item	Function	Reference	Status	Requirement
OMA-MCC-S-004	Support a response to Direct debit request	Section 6.2	M	
OMA-MCC-S-005	Support a response to Balance check request	Section 6.2	O	
OMA-MCC-S-006	Support a response to Refund request	Section 6.2	O	
OMA-MCC-S-007	Support a response to Price enquiry request	Section 6.2	O	

B.2.3 Session Charging

Item	Function	Reference	Status	Requirement
OMA-MCC-S-008	Support a response to Initial request	Section 6.2	M	
OMA-MCC-S-009	Support a response to Update request	Section 6.2	M	
OMA-MCC-S-010	Support a response to Termination request	Section 6.2	M	

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