OMA Online Charging Interface

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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:

- The online charging models, the logical messages and message types on the CH-2 interface.
- The OMA Charging Data Elements used in the logical messages with their descriptions.
- The flow of information exchanged between the Charging Enabler User and the Charging Enabler through time in different scenarios.
- Bindings of OMA CH-2 logical messages to specific protocols (i.e. the IETF Diameter Credit Control and Parlay X Web Services Payment API).

2. References

2.1 Normative References

[CHRG_AD]	"Charging Architecture". Open Mobile Alliance™. OMA-AD-Charging-V1_1, URL: http://www.openmobilealliance.org/
[CHRG_DDS]	"Charging Data", Open Mobile Alliance™. OMA-DDS-Charging_Data-V1_0, URL: http://www.openmobilealliance.org/
[IOPPROC]	"OMA Interoperability Policy and Process", Version 1.3, Open Mobile Alliance™, OMA-ORG-IOP_Process-V1_3-20050712, URL: http://www.openmobilealliance.org/
[PSA RRP]	"Parlay Service Access", Version 1.0, Open Mobile Alliance™, OMA-RRP-PSA-V1_0, URL: http://www.openmobilealliance.org/
[REST_TS_Payment]	"RESTful bindings for Parlay X Web Services – Payment", Version 1.0, Open Mobile Alliance™, OMA-TS-ParlayREST_Payment-V1_0, URL: http://www.openmobilealliance.org/
[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
[TS29.140]	"Multimedia Messaging Service (MMS); MM10 Interface based on Diameter Protocol", 3GPP TS29.140, URL: http://www.3gpp.org
[TS29.199-6]	"Open Service Access (OSA); Parlay X Web Services; Part 6: Payment" , 3GPP TS29.199-6, URL: http://www.3gpp.org
[TS32.299]	"Telecommunication management; Charging management; Diameter Charging Applications", 3GPP TS32.299, 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/

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:

3rd Party Charging	A mechanism of charging a third party not directly involved in service ordering and consumption. Authorization and authentication may need to be supported in order to prevent fraud.
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 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	See [OMA-DICT]
Charging Infrastructure	Any infrastructure that maintains the charging accounts.
Charging Correlation	See [OMA-DICT]
Correlation	See Charging Correlation
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 send, 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:

3GPP	3rd Generation Partnership Project
ABNF	Augmented Backus-Naur Form
AD	Architecture Document
API	Application Programming Interface
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
CHRG	Charging
DDS	Data Definition Specification
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
IMSI	International Mobile Subscriber Identity
IP	Internet Protocol
MSCC	Multiple Services Credit Control
MSISDN	Mobile Subscriber ISDN Number
OMA	Open Mobile Alliance
RAA	Re-Auth-Answer
RAR	Re-Auth-Request
RD	Requirements Document
RFC	Request for Comments
RSU	Requested Service Unit
SCR	Static Conformance Requirements
SI	Service Information
SIP	Session Initiation Protocol
TS	Technical Specification

URI   Uniform Resource Identifier

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 utilises this interface to communicate charging information to the underlying Charging Infrastructure using the Charging Enabler. The Charging Enabler User needs responses to the messages sent by it earlier to perform control of the service being rendered. For this reason, the interface defines a request-response message structure that is used for the Charging Enabler User to perform the needed session control.

This document is a guide for the developers of the Charging Enabler User and the online part of the Charging Enabler that interact with each other in order to provide the desired service to the subscribers.

5. Messages on CH-2

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

The 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 Figure 1 below.
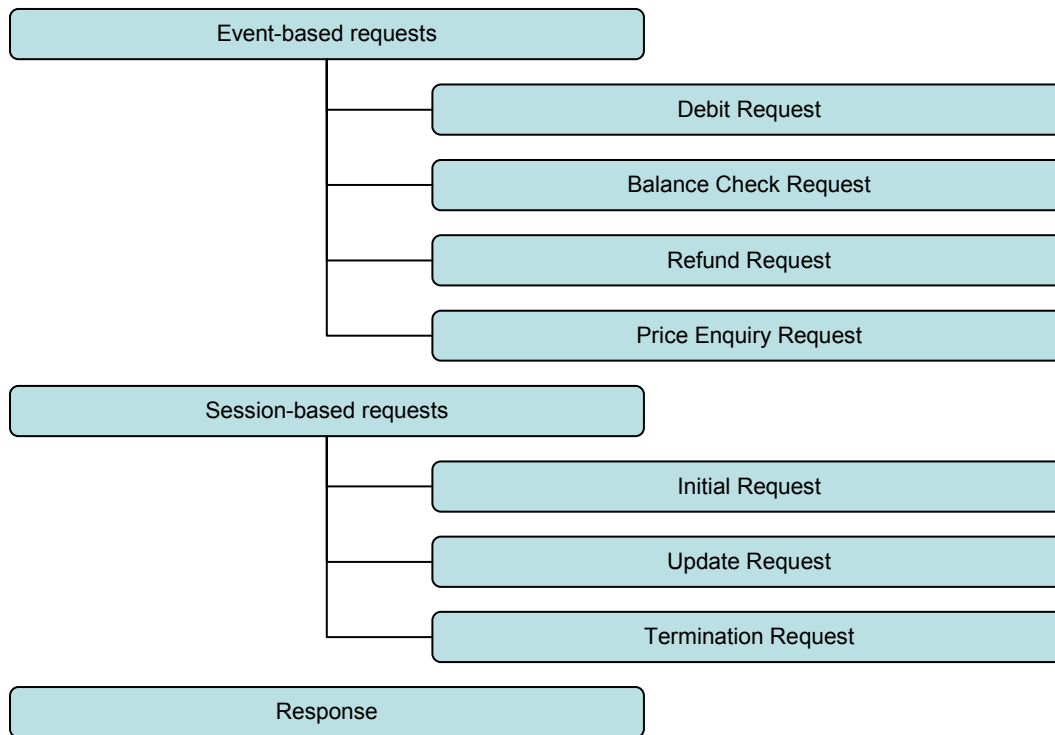
Figure 1: Messages on CH-2

Interactions between the Charging Enabler User and the Charging Enabler are based on **requests** and **responses (**also referred to in this document as request message and response message**)**. Charging requests are sent by the Charging Enabler User to the Charging Enabler. Charging responses are sent by the Charging Enabler to the Charging Enabler User.

Event-based requests are independent of each other, i.e. subsequent **requests** are treated as separate requests. Each Event-based request starts a new interaction and is followed by a single response which ends this interaction. From the interface and protocol perspective, all subsequent Event-based requests are unrelated to the previously completed interactions.

Session-based requests relate to interactions where consecutive **requests** are related to each other, constituting a charging session, i.e. a chain of request-response pairs.

6. Message Descriptions

6.1   Charging Request Messages

Event-based and Session-based **requests** share the same basic data element structure, which is described in Table 1. 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, e.g. data element "A" (level n) followed by data elements "B" and "C" (both being level n+1). This means that element A comprises element B and element C as sub-level-elements. 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 SHALL use the same value.
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	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 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 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.
1	AoC Request Type	Optional	This data element denotes if AoC Information is requested and what type of information is needed.
1	Multiple Service Indicator	Optional	This data element indicates the use of Multiple Services Credit Control data element.
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 SHALL be included when this data element is included.

Level	OMA Charging Data Element	Category	Description
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 SHALL 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	Reporting Reason	Optional	This data element specifies the reason for usage reporting for one or more types of quota for a particular category.
3	Tariff Change Usage	Optional	This data element identifies the reporting period for the used service unit, i.e. before, after or during tariff change.
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 SHALL 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 SHALL 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.

Level	OMA Charging Data Element	Category	Description
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.
2	Rating Group	Optional	This data element contains the identifier of a rating group.
2	Reporting Reason	Optional	This data element specifies the reason for usage reporting for one or more types of quota for a particular category.
2	Trigger	Optional	This data element contains the trigger types.
3	Trigger Type	Optional	This data element indicates a single re-authorisation event 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 Key	Optional	This data element can be used to identify the particular service item delivered.
1	Correlation Id	Optional	This data element contains information to correlate charging requests generated for different service components of the application.
Information related to OMA service usage			
1	Application Server Id	Optional	This data element can be used to identify the application server providing the service and/or generating the charging information.
1	Application Session Id	Optional	This data element can be used to identify the application-level session to which the charging information relates. Note that the Session Id data element identifies the charging session between a charging enabler user and a charging enabler.
1	Delivery Status	Optional	This data element can be used to carry information related to the success status of service delivery.
1	Service Key	Optional	This data element can be used to identify the particular service item delivered.
1	Correlation Id	Optional	This data element contains information to correlate charging requests generated for different service components of the application.
1	Message Body	Optional	This grouped data element contains information related to content exchanged in a message.
2	Content Type	Mandatory	This data element identifies the type of content, for example using MIME types.

Level	OMA Charging Data Element	Category	Description
2	Content Length	Mandatory	This data element identifies the length of content.
2	Content Disposition	Optional	This data element indicates how the message body or a message body part is to be interpreted (e.g. session, render),
2	Originator	Optional	This data element indicates the originating party of the message body.
1	Participant Group	Optional	This grouped data element contains information on a participant to a service-level session.
2	Called Party Address	Optional	This data element identifies an individual participant to a service-level session.
1	Role of Node	Optional	This data element can be used to identify the role of the node generating the charging event in the service event, e.g. sending, receiving, controlling and participating.
1	Role of User	Optional	This data element can be used to identify the role of the user which the charging event relates to in the service event, e.g. session owner or participant.
1	Application Service Type	Optional	This data element can be used to differentiate between the different roles of a node within service events, e.g. the sending and receiving roles of participating and controlling functions.
1	Number of participants	Optional	This data element can be used to indicate the number of parties involved in the service event, e.g. participating a session.
1	Calling Party Address	Optional	This data element can be used to identify the party initiating the service event, e.g. the sender of a message. The initiating party is usually indicated in the Subscription Id data element in its role as the charged party. However, the charged party may also be some other party while the actual initiating party still needs to be identified.
1	Called Party Address	Optional	This data element can be used to identify the receiving party of a communication or the party that is the target of an operation (other than the initiator).
1	Group Name	Optional	This data element can be used to indicate the identifier of a group related to the event, e.g. a pre-defined distribution group in a messaging service.
1	Application Charging Identifier	Optional	This data element holds an identifier that enables the correlation of various records pertaining to the same session.
1	Inter-Operator Id	Optional	The IOI identifies both originating and terminating networks involved in a session/transaction.
2	Originating IOI	Mandatory	Identifies the originating network.
2	Terminating IOI	Mandatory	Identifies the terminating network.
1	Access Network Information	Optional	This data element can be used to carry information related to the access network used if available.
1	Total Number of Messages Sent	Optional	This data element can be used to indicate the number of individual messages sent by the user. However, the number does not necessarily correspond to the number of message actually delivered.
1	Total Number of Messages Exploded	Optional	This data element can be used to indicate the total number of messages exploded by the IM server.
1	Number of Messages Successfully Sent	Optional	This data element indicates the number of individual

Level	OMA Charging Data Element	Category	Description
			messages sent by the user that were successfully delivered to at least one recipient.
1	Number of Messages Successfully Exploded	Optional	This data element can be used to indicate the total number of messages exploded by the IM server that were successfully delivered.
1	SIP Method	Optional	This data element can be used to identify the SIP Method triggering the charging event.
1	Expires	Optional	The Expires data element indicates the relative time after which the SIP message expires.
1	Cause Code	Optional	This data element can be used to indicate the returned SIP status code for the service request.
1	Time Stamps	Optional	This data element can be used to carry timestamps of a service delivery operation.
2	SIP Request Timestamp	Optional	This data element can be used to carry a timestamp related to the start of a service delivery operation.
2	SIP Request Timestamp Fraction	Optional	This data element holds the miliseconds fraction in relation to SIP Request Timestamp.
2	SIP Response Timestamp	Optional	This data element can be used to carry a timestamp related to the end of a service delivery operation.
2	SIP Response Timestamp Fraction	Optional	This data element holds the miliseconds fraction in relation to SIP Response Timestamp.
1	Content ID	Optional	This data element will be used as identifier sets by the Content Provider, and unique within the DCD Service Provider's domain.
1	Content provider ID	Optional	This data element will be used as the globally unique identity of the content provider within the DCD Server Domain.
1	AoC Information	Optional	This data element contains the detailed information for Advice of Charge and holds sub-elements.
2	AoC Cost Information	Optional	This data element specifies the AoC cost specific parameters. AoC-Cost-Information is used only in the Credit Control Answer.
3	Incremental Cost	Optional	This data element specifies the amount charged since the last report.
4	Value Digits	Mandatory	This data element contains the significant digits of a Unit Value without any decimal point.
4	Exponent	Optional	This data element contains the 10^{-x} exponent that should be applied to the Value Digits.
3	Currency Code	Optional	Ommited if the amount is in non-monetary units units
2	Tariff Information	Optional	This data element specifies the Tariff specific parameters.
3	Current Tariff	Mandatory	This data element specifies the Tariff for the current time period.
4	Scale Factor	Optional	This data element holds simple multiplication factor in the same format as Unit-Value.
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	Rate Element	Optional	This data element holds simple rate element of one dimension.

Level	OMA Charging Data Element	Category	Description
5	CC Unit Type	Mandatory	This data element specifies the type of units considered to be pooled into a credit pool.
5	Reason Code	Optional	This data element identifies if the Rate-Element corresponds to a specific NNI charge type.
5	Unit Value	Optional	This data element specifies the units as decimal value.
5	Unit Cost	Optional	This data element holds monetary value.
6	Value Digits	Mandatory	This data element contains the significant digits of a Unit Value without any decimal point.
6	Exponent	Optional	This data element contains the 10-x exponent that should be applied to the Value Digits.
3	Tariff Time Change	Optional	This data element specifies the tariffs switch time.
3	Next Tariff	Optional	This data element specifies the Tariff for the next time period.
2	AoC Subscription Information	Optional	This data element holds the subscription and formatting parameters.
3	AoC Service	Optional	This data element holds the pair of AoC Service type and AoC Service obligatory type.
4	AoC Service Obligatory Type	Optional	This data element holds the information if the AoC information is binding or not.
4	AoC Service Type	Optional	This data element defines the type of AoC information to be provided to the subscriber.
3	AoC Format	Optional	This data element holds the format on how the AoC information shall be sent to the user.
3	Preferred AoC Currency	Optional	This data element indicates the preferred currency code that the AoC function would like to get the AoC information.

Table 1: Charging Request message

6.1.1   Event-based Request

6.1.1.1   Debit Request

The debit request is used to combine the operations of checking for sufficient account balance before service delivery and committing the debit request to the account based on the same debit request message. In case the account balance is sufficient for the requested service usage, the account is immediately debited and a separate request to commit the credit reservation SHALL NOT be done. 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.

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 account has sufficient credit 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

The Refund Request is to enable services employing this feature to refund service units to the 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   Session-based Requests

Session-based request messages share the same basic data element structure as described above. The specific parameter values and their meaning, as well as any additional data elements in the different Session-based request types are explained in the following subsections.

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

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 includes the Used Service Unit structure, and to request quota, the Requested Service Unit structure is 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

6.2 Charging Response Messages

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, e.g. data element "A" (level n) followed by data elements "B" and "C" (both being level n+1). This means that element A comprises of element B and element C as sub-level-elements.

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 SHALL use the same value.
1	Result Code	Mandatory	This data element indicates the result of a particular request.
1	Request Type	Mandatory	This data element contains the reason for sending the online charging request message
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 is released or a new Request is 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 SHALL be included when this data element is included.

Level	OMA Charging Data Element	Category	Description
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 SHALL 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.
2	Rating Group	Optional	This data element contains the identifier of a rating group.
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.

Level	OMA Charging Data Element	Category	Description
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.
3	Value Digits	Mandatory	This data element contains the significant digits of a Unit Value without any decimal point.
3	Exponent	Optional	This data element contains the 10-x exponent that should be applied to the Value Digits.
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	Low Balance Indication	Optional	This data element indicates a low balance threshold with regard to the designated service usage. This indication can be used, e.g. to advise the end-user about a need to replenish the account balance.
1	AoC Information	Optional	This data element contains the detailed information for Advice of Charge and holds sub-elements.
2	AoC Cost Information	Optional	This data element specifies the AoC cost specific parameters. AoC-Cost-Information is used only in the Credit Control Answer.
3	Accumulated Cost	Optional	This data element specifies the amount charged since the beginning of the session
4	Value Digits	Mandatory	This data element contains the significant digits of a Unit Value without any decimal point.
4	Exponent	Optional	This data element contains the 10-x exponent that should be applied to the Value Digits.
3	Incremental Cost	Optional	This data element specifies the amount charged since the last report.
4	Value Digits	Mandatory	This data element contains the significant digits of a Unit Value without any decimal point.
4	Exponent	Optional	This data element contains the 10-x exponent that should be applied to the Value Digits.
3	Currency Code	Optional	Ommited if the amount is in non-monetary units units
2	Tariff Information	Optional	This data element specifies the Tariff specific parameters.
3	Current Tariff	Mandatory	This data element specifies the Tariff for the current time period.
4	Scale Factor	Optional	This data element holds simple multiplication factor in the same format as Unit-Value.
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.

Level	OMA Charging Data Element	Category	Description
4	Rate Element	Optional	This data element holds simple rate element of one dimension.
5	CC Unit Type	Mandatory	This data element specifies the type of units considered to be pooled into a credit pool.
5	Reason Code	Optional	This data element identifies if the Rate-Element corresponds to a specific NNI charge type.
5	Unit Value	Optional	This data element specifies the units as decimal value.
5	Unit Cost	Optional	This data element holds monetary value.
6	Value Digits	Mandatory	This data element contains the significant digits of a Unit Value without any decimal point.
6	Exponent	Optional	This data element contains the 10-x exponent that should be applied to the Value Digits.
5	Unit Quota Threshold	Optional	This data element contains a threshold value in service specific units
3	Tariff Time Change	Optional	This data element specifies the tariffs switch time.
3	Next Tariff	Optional	This data element specifies the Tariff for the next time period.

Table 9: Charging Response message

7. Flows

In this section, Event-based and Session-based charging flows are illustrated.

7.1 Event-based Charging

Event-based charging flow is used for single event charging requests.

7.1.1 Immediate Event Charging
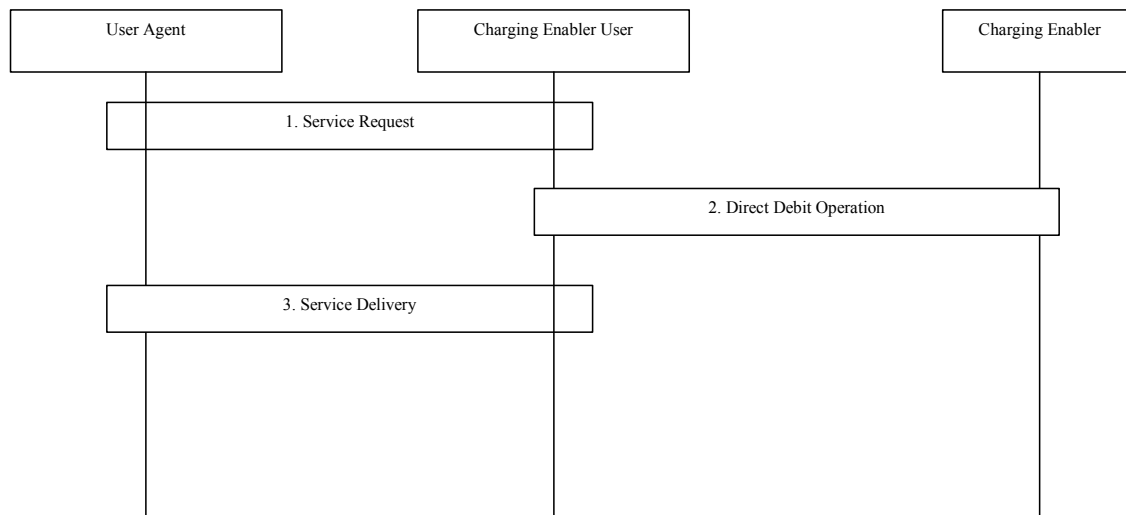
Figure 2: Immediate Event Charging

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.

7.1.2   Event Charging with Reservation
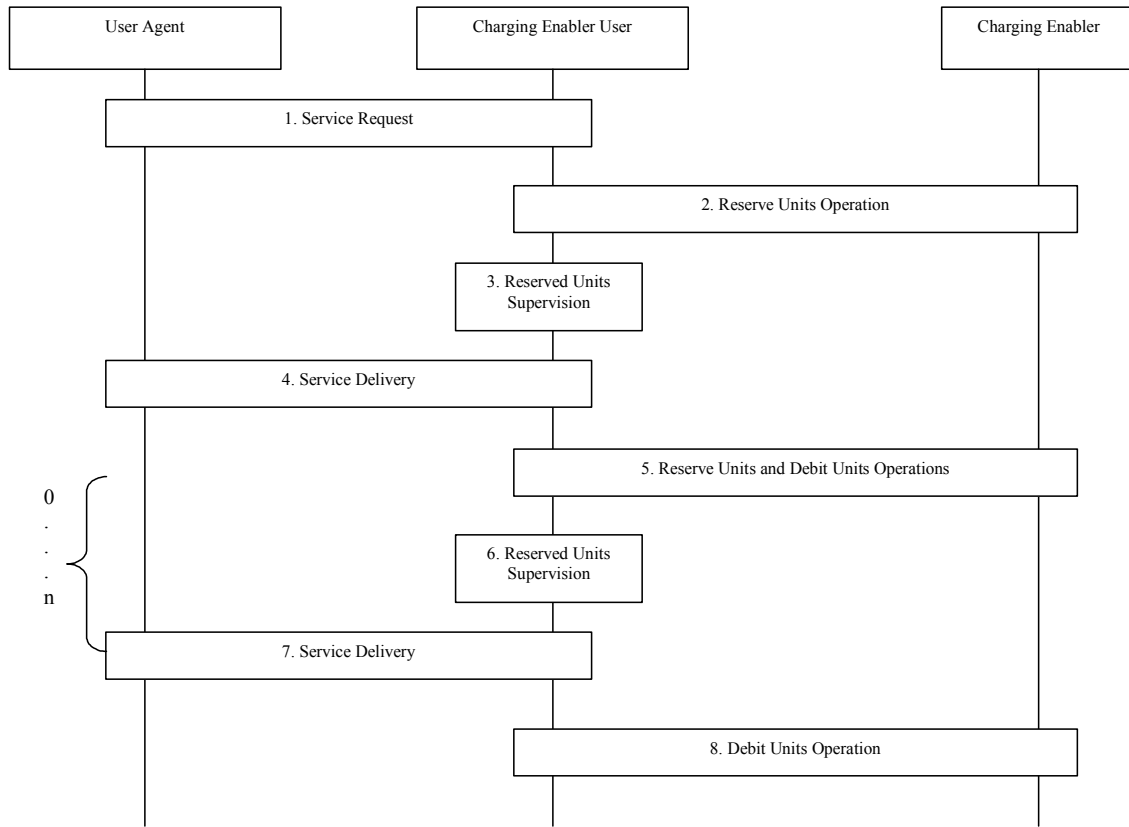
Figure 3: Event Charging with Reservation

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.

7.2 Session-based Charging

7.2.1 Session Charging with Reservation
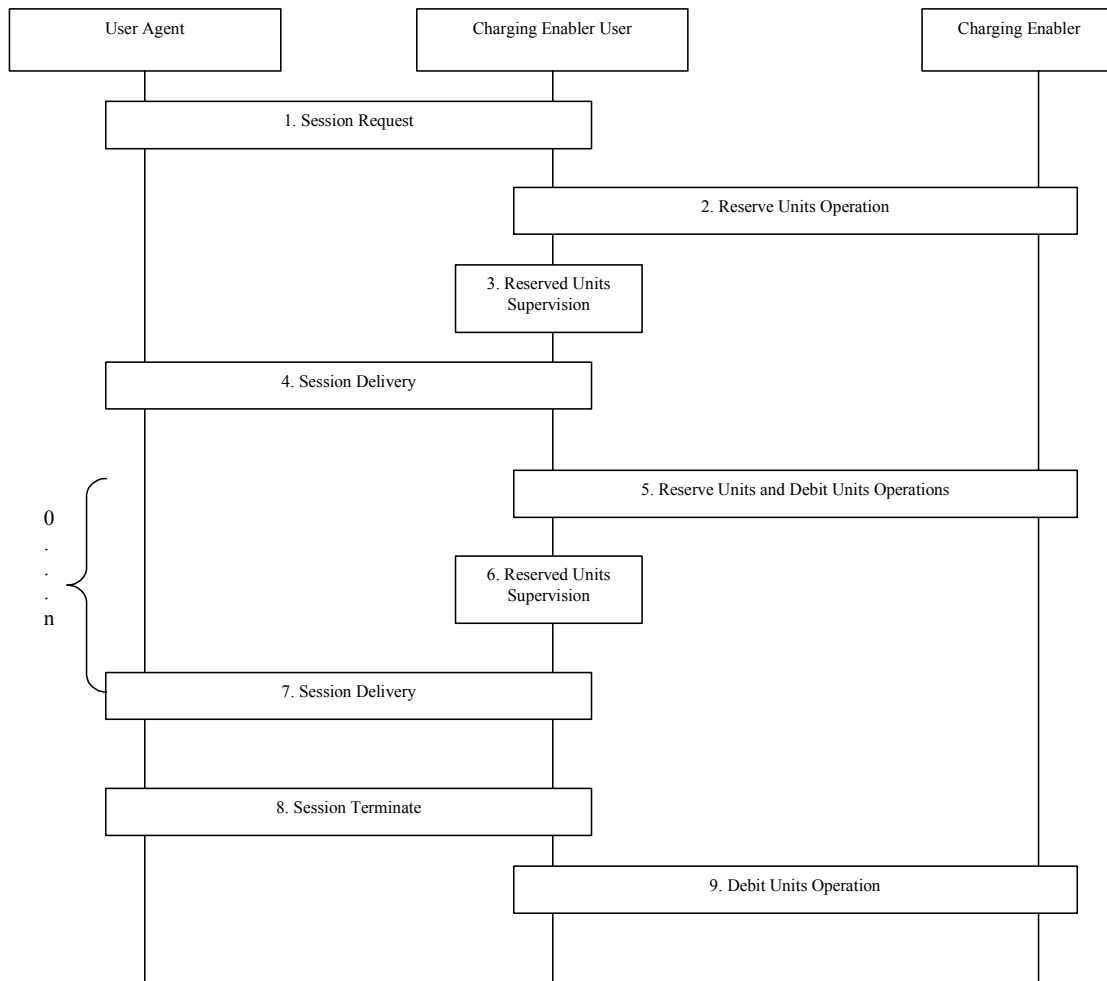
Figure 4: Session Charging with Reservation

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 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.

7. **Service 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 Flows

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.

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).

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-based Request or the Initial Request for a session is sent from the Charging Enabler User to the Charging Enabler.

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).

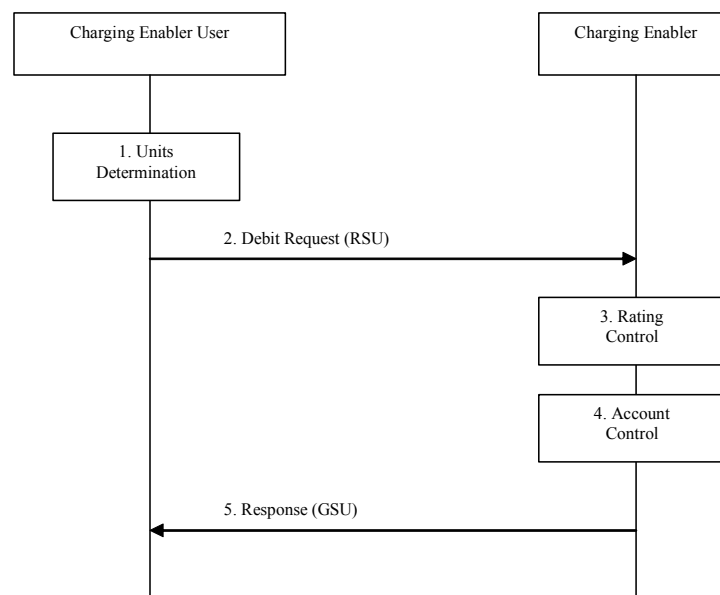## 7.3.2.2 Decentralized Unit Determination and Centralized Rating

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).

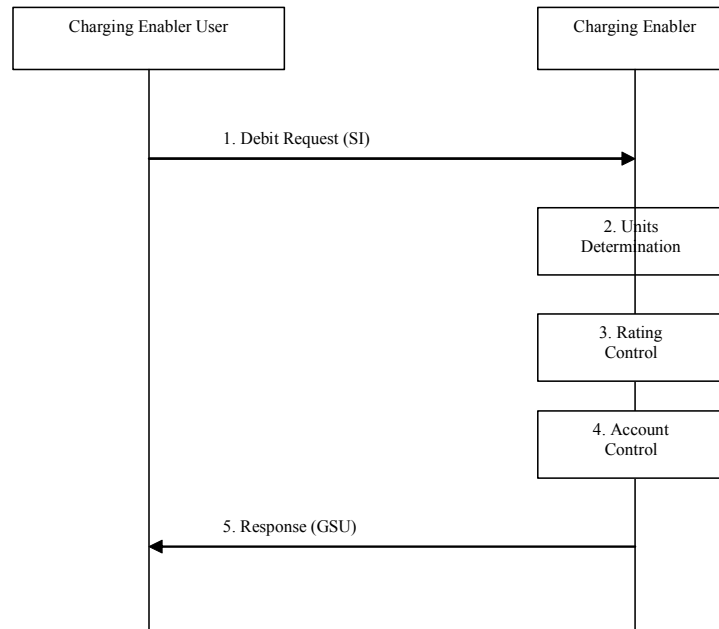### 7.3.2.3   Centralized Unit Determination and Centralized Rating
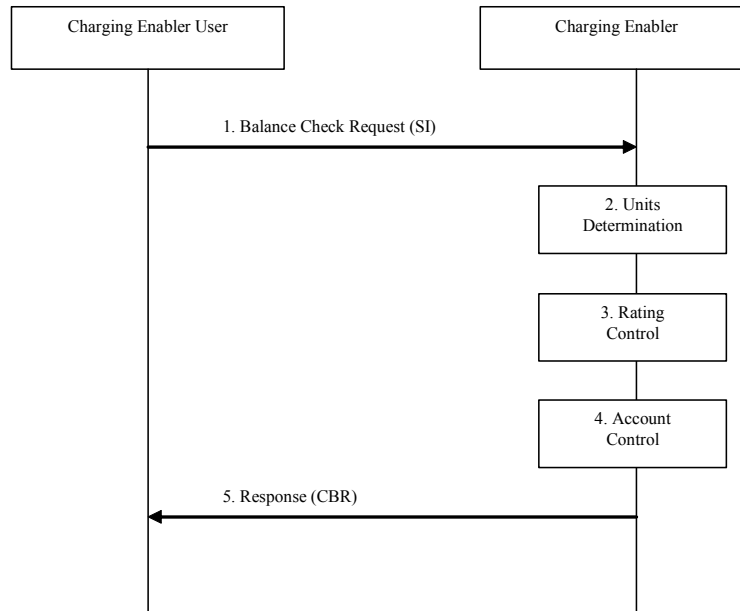
Figure 10: Balance Check Operation - Centralized Unit Determination and Centralized Rating

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-based Request or the Initial Request for a session is sent from the Charging Enabler User to the Charging Enabler.
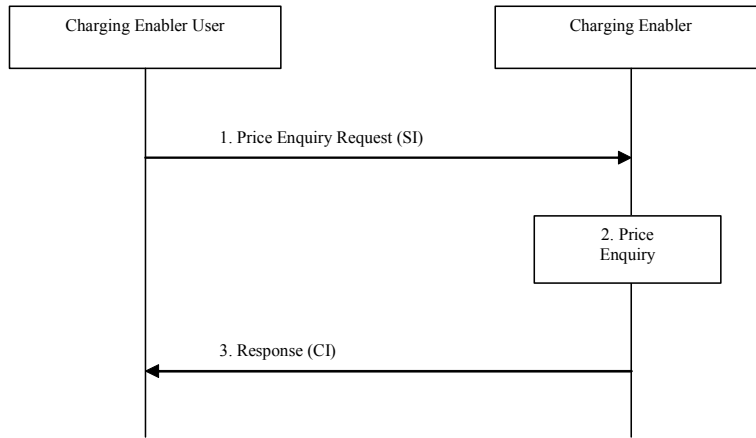
Figure 11: Price Enquiry Operation

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.

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.

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.

7.3.5.1 Decentralized Unit Determination and Centralized Rating
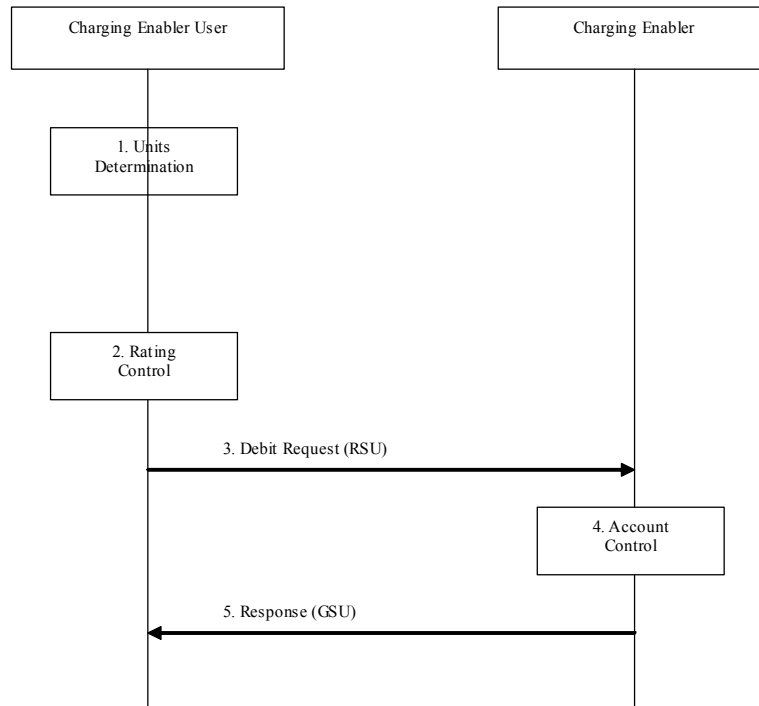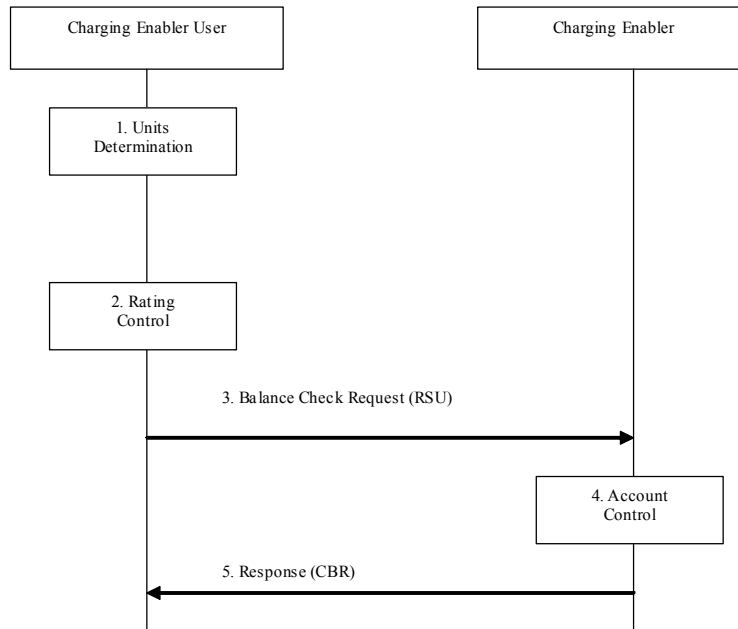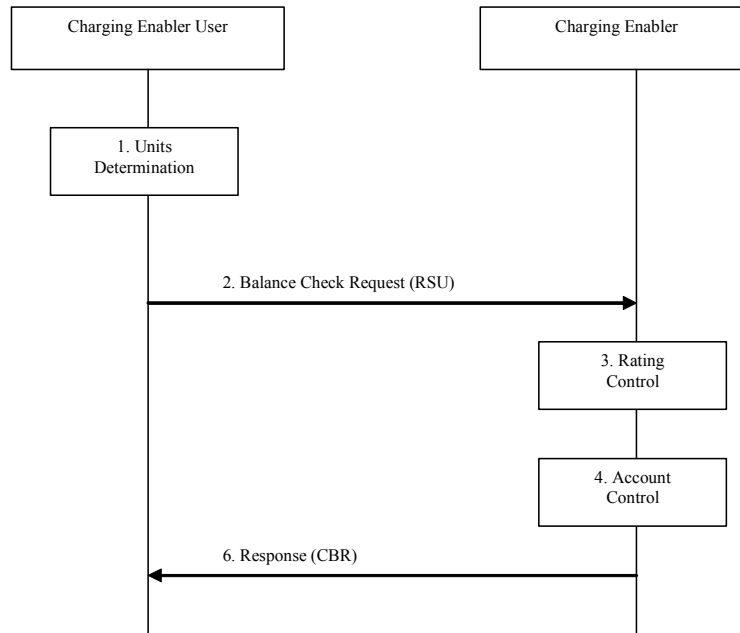

Figure 14: Reserve Units Operation - Decentralized Unit Determination and Centralized Rating

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).

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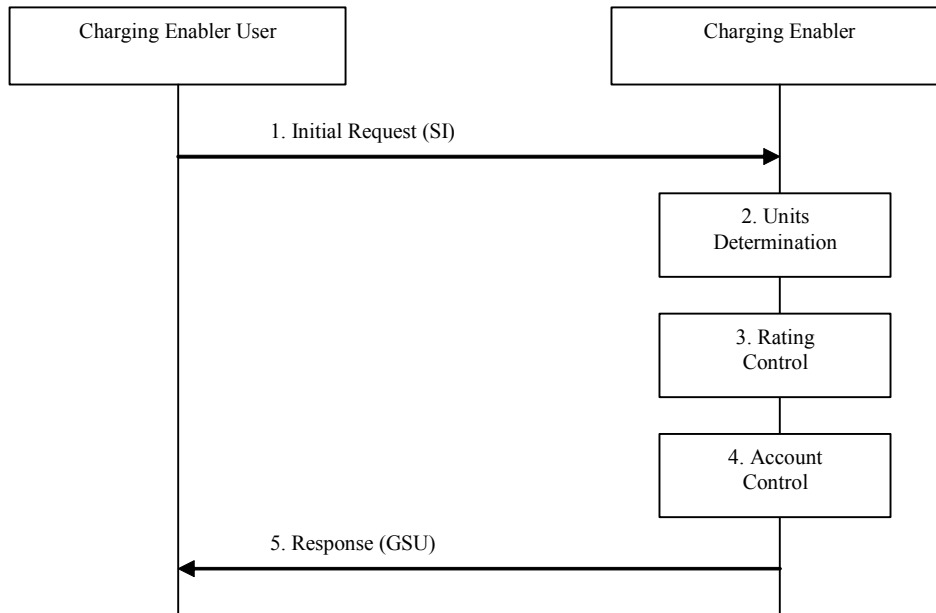
Figure 15: Reserve Units Operation - Centralized Unit Determination and Centralized Rating

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).

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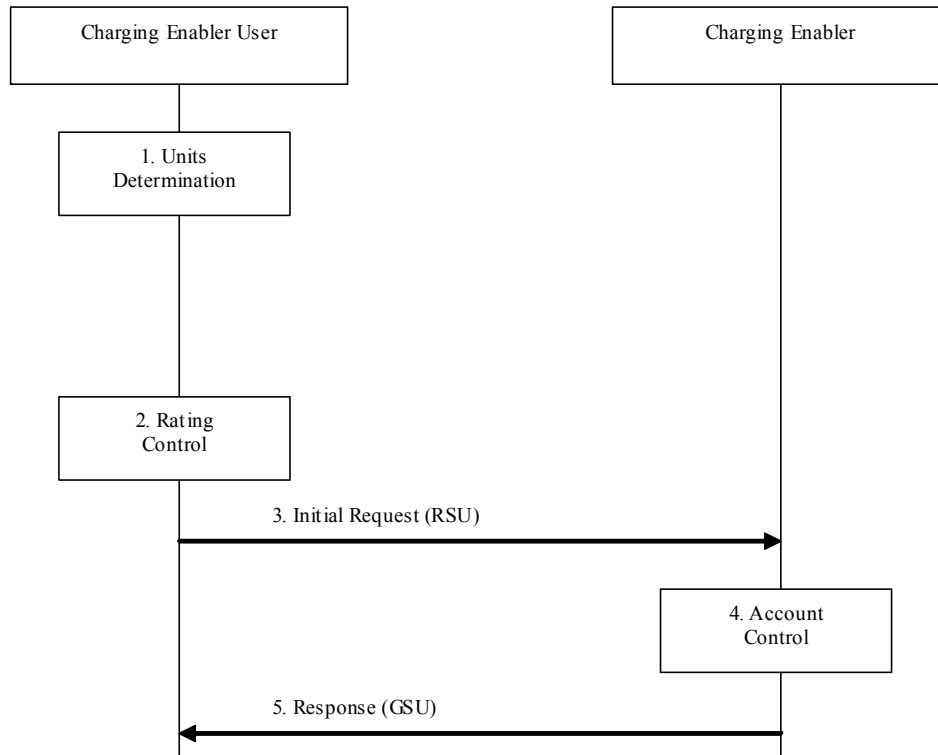
Figure 16: Reserve Units Operation - Decentralized Unit Determination and Decentralized Rating

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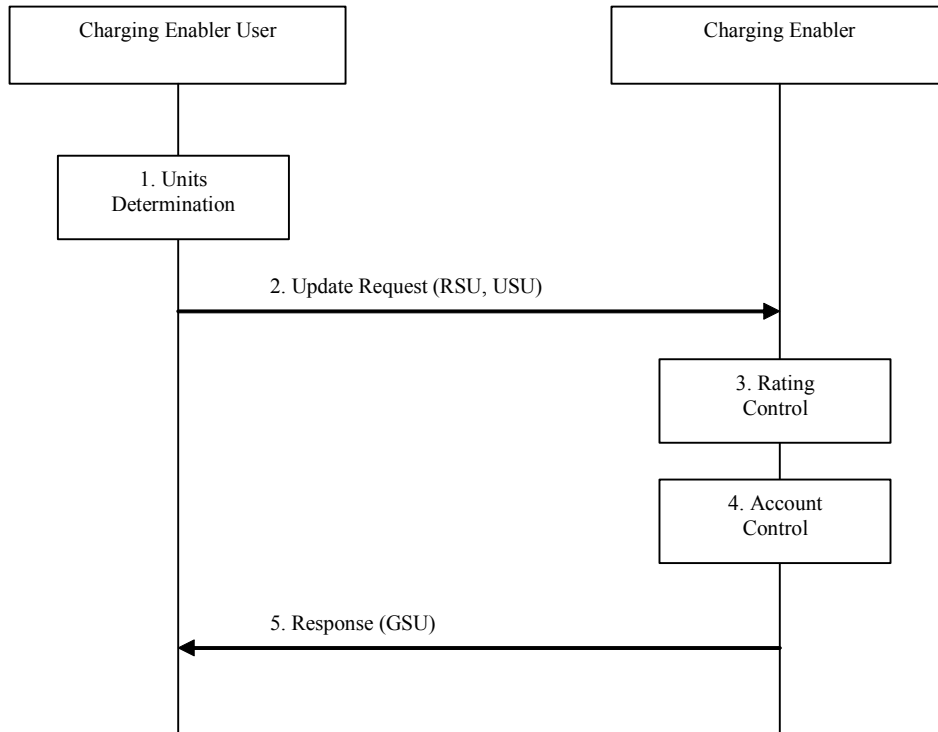
Figure 17: Reserve Units and Debit Units Operations - Decentralized Unit Determination and Centralized Rating

1. **Units Determination:** The Charging Enabler User determines the number of units associating with requested service.
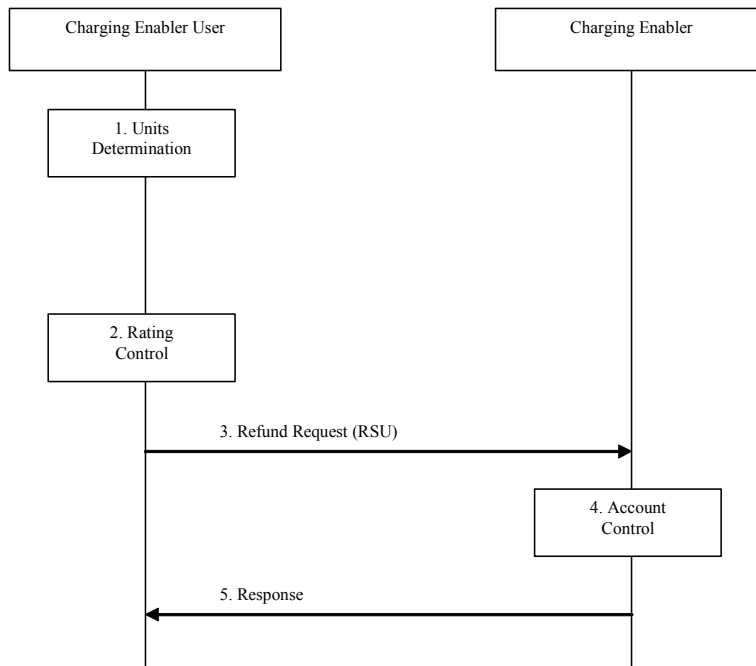
2. **Update Request:** The Charging Enabler User sends Update Request with Request Type set to UPDATE_REQUEST to indicate service specific information to the Charging Enabler. The request message includes Requested Service Unit (RSU) (service units) indicating the number of units determined and Used 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).

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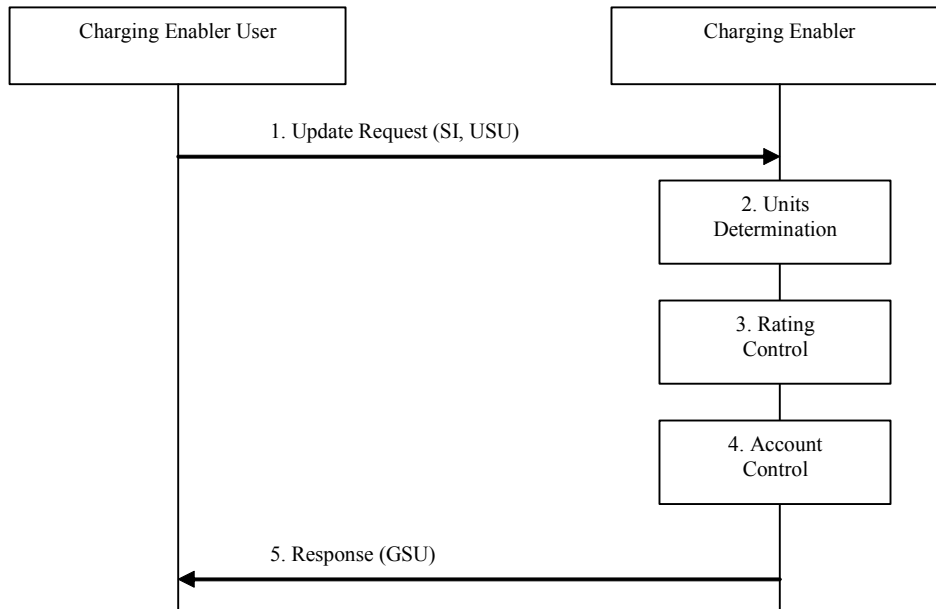
Figure 18: Reserve Units and Debit Units Operations - Centralized Unit Determination and Centralized Rating

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).

7.3.6.2   Decentralized Unit Determination and Decentralized Rating

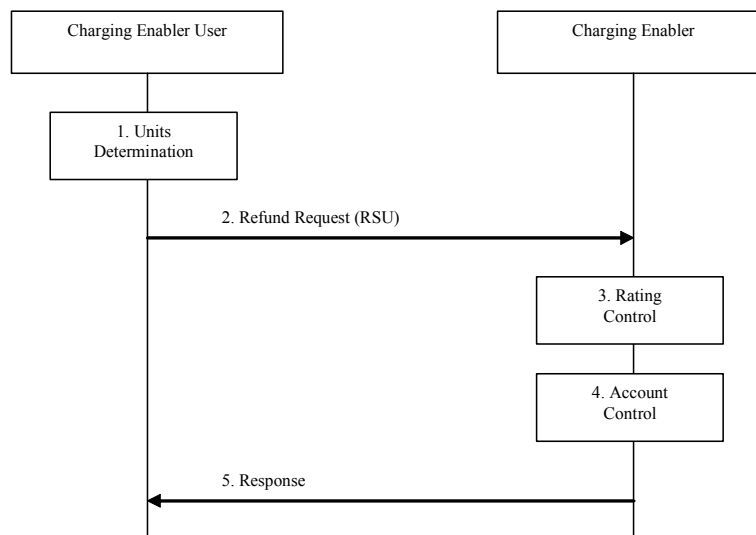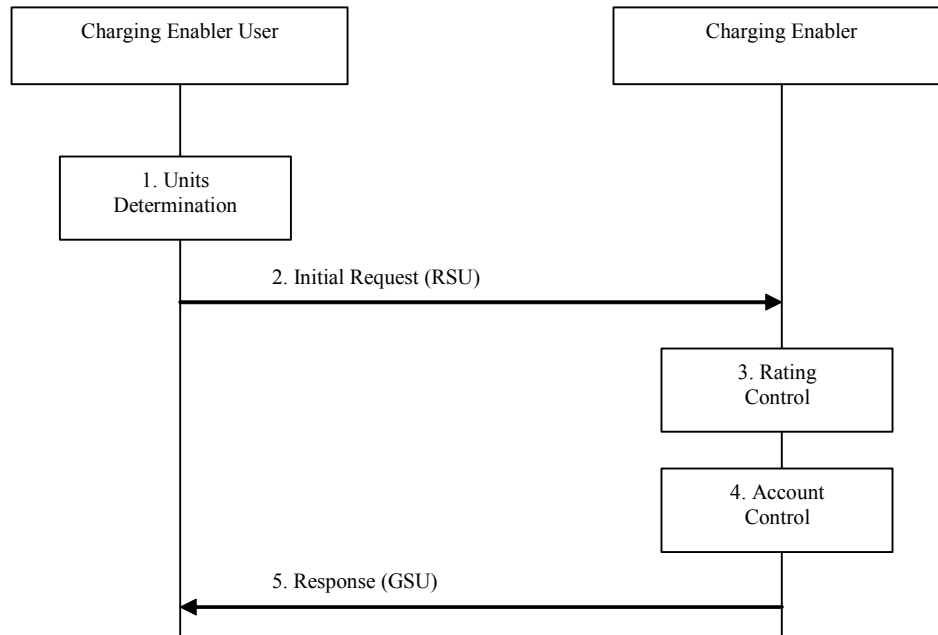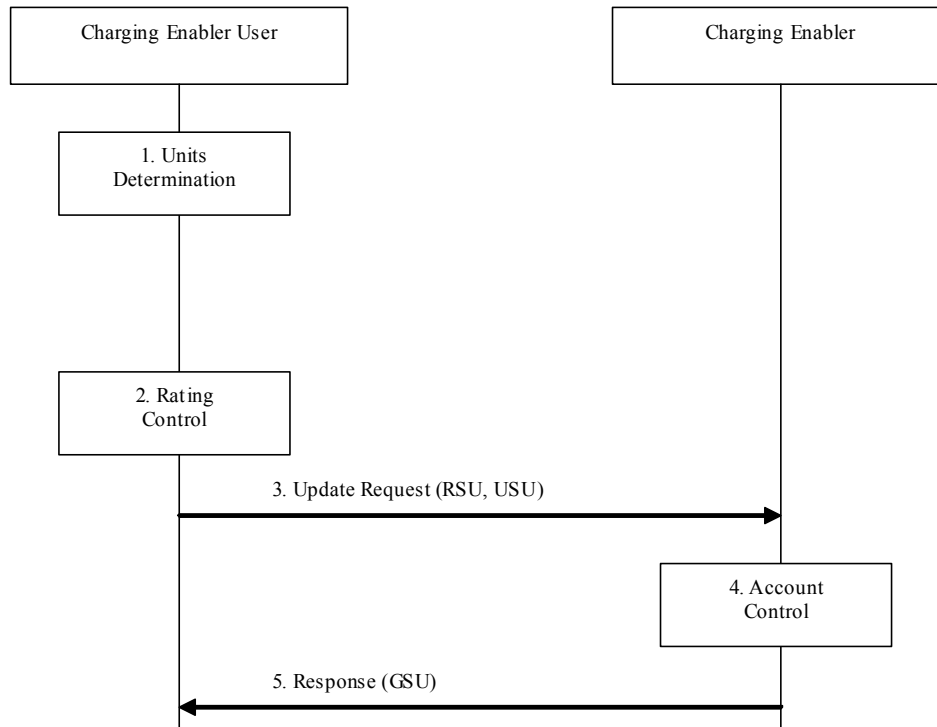**Figure 19: Reserve Units and Debit Units Operations - Decentralized Unit Determination and Decentralized Rating**

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.

7.3.7.1   Centralized Rating
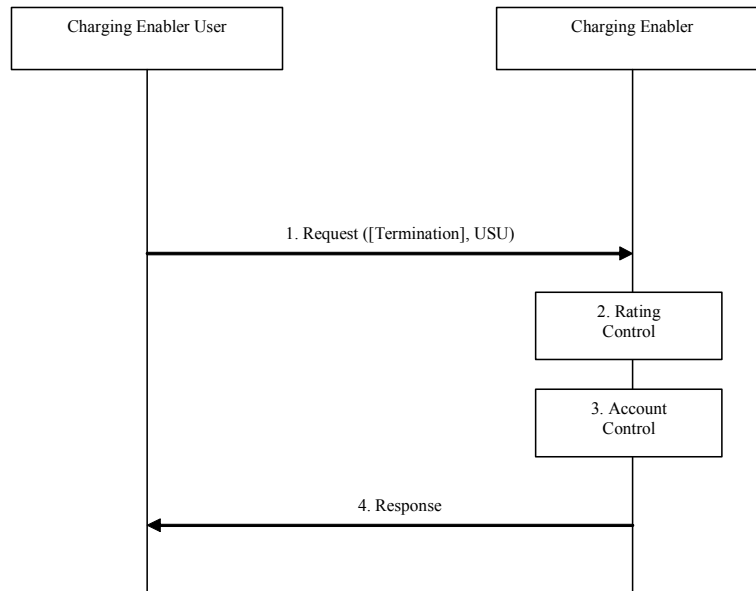
Figure 20: Debit Units Operation - Centralized Rating

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.

7.3.7.2   Decentralized Rating
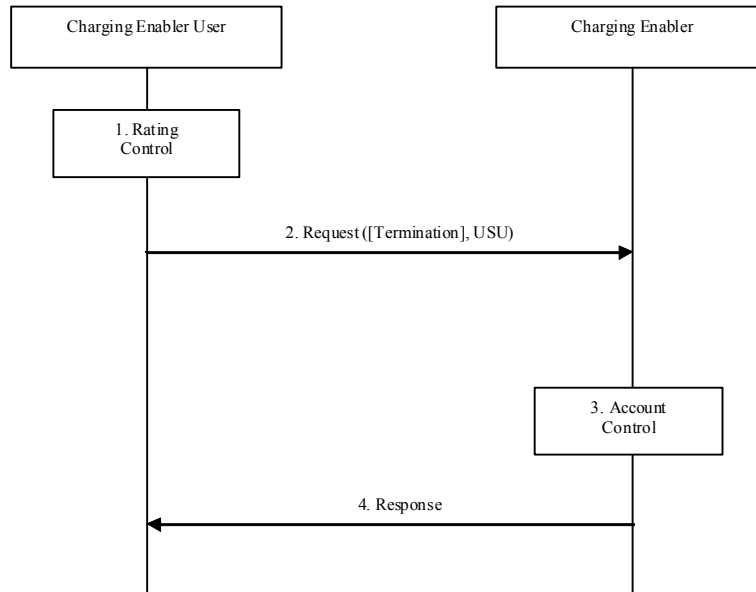
Figure 21: Debit Units Operation - Decentralized Rating

1. **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.
2. **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) (service units) indicating the number of units used.
3. **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.
4. **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.

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 SHALL be supported.

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

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

The Charging Enabler User maps to the Diameter Client in the sense that it is the entity requesting resource allocation and credit control. The Charging Enabler maps to the Diameter Credit Control 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 in grey colour, e.g. [Acct Multi Session Id]. If such parameters are present, they will not constitute an error. The bracket convention and the asterisk (*) below SHALL be used as described 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 Figure 22 describes the protocol layering architecture.

The service/enabler specific parts that are specified by OMA are provided within the Reference Releases of the Charging Data Definition Specification [CHRG_DDS] and the usage of the specific data elements are detailed in the specifications of the appropriate OMA Enabler, either as a separate Enabler Charging TS or as part of a broader Enabler TS.
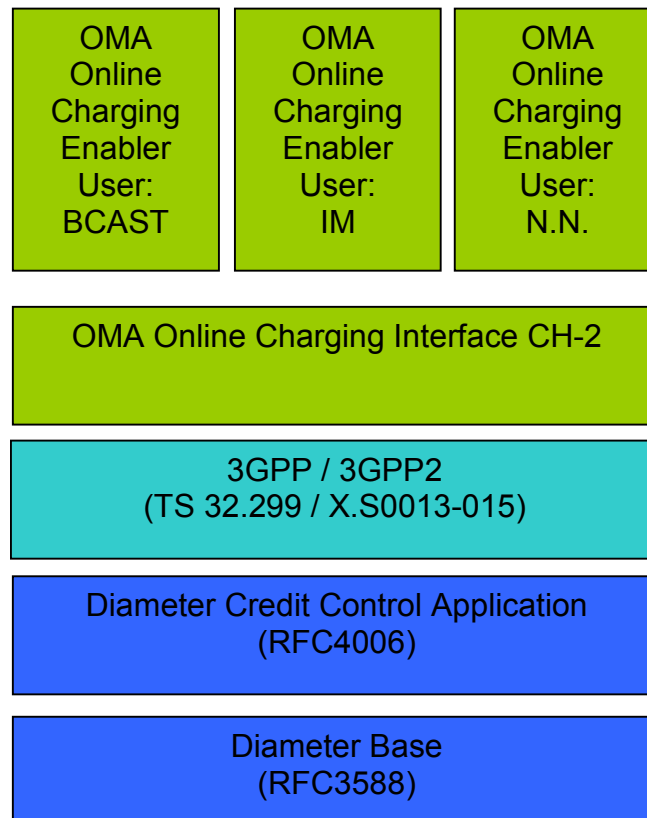
Figure 22: Protocol Layering Architecture

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-based and Session-based requests. The Diameter Credit-Control Answer (CCA) messages are used to communicate Event-based 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:

- Abort-Session-Request (ASR);

- Capability-Exchange-Answer (CEA);

- Device-Watchdog-Request (DWR) and Device-Watchdog-Answer (DWA);

- Disconnect-Peer-Request (DPR) and Disconnect-Peer-Answer (DPA);

- Re-Auth-Request (RAR);

- and by Charging Enabler User: Re-Auth-Answer (RAA);

- Capability-Exchange-Request (CER););

- Device-Watchdog-Request (DWR) and Device-Watchdog-Answer (DWA);

- Abort-Session-Answer (ASA);

- Disconnect-Peer-Request (DPR) and Disconnect-Peer-Answer (DPA).

8.1.3.1   Credit-Control Request Message

The CCR message 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 according to the value carried in the CC-Request-Type AVP: EVENT_REQUEST (value 4) for an Event-based request, 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]
                            [AoC-Request-Type]
                           *[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 Message

The CCA message is sent from the Charging Enabler to the Charging Enabler User in response to a CCR message and is used in order to authorise and allocate credit for resource usage. This message 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 }
                        { 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]
                        [ Low-Balance-Indication ]
                        [ 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 ]
                        [ Service-Information ]
                       *[ 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 [CHRG_DDS].

OMA Charging Data Element	Diameter AVP
Access Network Information	Access-Network-Charging-Identifier-Value
AoC Request Type	AoC-Request-Type
Application Server Id	Application-Server-Id
Application Service Type	Application-Service-Type
Application Session Id	Application-Session-Id
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
Time	CC-Time

OMA Charging Data Element	Diameter AVP
Total Octets	CC-Total-Octets
Called Party Address	Called-Party-Address
Calling Party Address	Calling-Party-Address
Cause Code	Cause-Code
Content Disposition	Content-Disposition
Check Balance Result	Check-Balance-Result
Content ID	Content-ID
Content Length	Content-Length
Content provider ID	Content-provider-ID
Content Type	Content-Type
Cost Information	Cost-Information
Cost Unit	Cost-Unit
Currency Code	Currency-Code
Delivery Status	Delivery-Status
Event Timestamp	Event-Timestamp
Expires	Expires
Exponent	Exponent
Granted Service Unit	Granted-Service-Unit
Application Charging Identifier	IMS-Charging-Identifier
Inter-Operator Identifier	Inter-Operator-Identifier
Low Balance Indication	Low-Balance-Indication
Message Body	Message-Body
Multiple Services Credit Control	Multiple-Services-Credit-Control
Multiple Service Indicator	Multiple-Service-Indicator
Number of Messages Successfully Exploded	Number-of-Messages-Successfully-Exploded
Number of Messages Successfully Sent	Number-of-Messages-Successfully-Sent
Number of participants	Number-of-Participants
Originator	Originator
Originating IOI	Originating-IOI
Participant Group	Participant-Group
Group Name	PoC-Group-Name
Role of Node	PoC-Server-Role
Role of User	PoC-User-Role
Reporting Reason	Reporting-Reason
Requested Action	Requested-Action
Requested Service Unit	Requested-Service-Unit
Result Code	Result-Code
Service Context Id	Service-Context-Id
Service Identifier	Service-Identifier
Session Id	Session-Id
SIP Method	SIP-Method
SIP Request Timestamp	SIP-Request-Timestamp
SIP Request Timestamp Fraction	SIP-Request-Timestamp-Fraction

OMA Charging Data Element	Diameter AVP
SIP Response Timestamp	SIP-Response-Timestamp
SIP Response Timestamp Fraction	SIP-Response-Timestamp-Fraction
Subscription Id	Subscription-Id
Subscription Data	Subscription-Id-Data
Subscription Type	Subscription-Id-Type
Tariff Change Usage	Tariff-Change-Usage
Terminating IOI	Terminating-IOI
Time Stamps	Time-Stamps
Trigger	Trigger
Trigger Type	Trigger-Type
Total Number of Messages Exploded	Total-Number-of-Messages-Exploded
Total Number of Messages Sent	Total-Number-of-Messages-Sent
Correlation Id	[CHRG_DDS]
Service Key	[CHRG_DDS]
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.

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	
Access-Network-Charging-Identifier-Value	503	O	-	-	-	[TS29.214]	OctetString	V,M	P	-	-	Y
Accumulated-Cost	2052	-	-	O	-	[TS32.299]	Grouped	V,M	P	-	-	N
AoC-Cost-Information	2053	O	-	O	-	[TS32.299]	Grouped	V,M	P	-	-	N
AoC-Format	2310	O	-	-	-	[TS32.299]	Enumerated	V,M	P	-	-	N
AoC-Information	2054	O	-	O	-	[TS32.299]	Grouped	V,M	P	-	-	N
AoC-Request-Type	2055	O	-	-	-	[TS32.299]	Enumerated	V,M	P	-	-	N
AoC-Service	2311	O	-	-	-	[TS32.299]	Grouped	V,M	P	-	-	N
AoC-Service-Obligatory-Type	2312	O	-	-	-	[TS32.299]	Enumerated	V,M	P	-	-	N
AoC-Service-Type	2313	O	-	-	-	[TS32.299]	Enumerated	V,M	P	-	-	N
AoC-Subscription-Information	2314	O	-	-	-	[TS32.299]	Grouped	V,M	P	-	-	N
Application-Server-Id	2101	O	-	-	-	[CHRG_DDS]	UTF8String	V,M	P	-	-	Y
Application-Service-Type	2102	O	-	-	-	[CHRG_DDS]	Enumerated	V,M	P	-	-	Y
Application-Session-Id	2103	O	-	-	-	[CHRG_DDS]	Unsigned32	V,M	P	-	-	Y
Auth-Application-Id	258	M	-	M	-	[RFC3588]	Unsigned32	M	P	-	V	N
Called-Party-Address	832	O	-	-	-	[TS32.299]	UTF8String	V,M	P	-	-	N
Calling-Party-Address	831	O	-	-	-	[TS32.299]	UTF8String	V,M	P	-	-	N
Cause-Code	861	O	-	-	-	[TS32.299]	Integer32	V,M	P	-	-	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
CC-Unit-Type	454	M	-	M	-	[RFC4006]	Unsigned64	M	P	-	V	Y
Check-Balance-Result	422	-	-	O	-	[RFC4006]	Enumerated	M	P	-	V	Y
Content-Disposition	828	O	-	-	-	[TS32.299]	UTF8String	V,M	P	-	-	N
Content-ID	2116	O	-	-	-	[CHRG_DDS]	UTF8String	V,M	P	-	-	Y
Content-Length	827	O	-	-	-	[TS32.299]	Unsigned32	V,M	P	-	-	N
Content-provider-ID	2117	O	-	-	-	[CHRG_DDS]	UTF8String	V,M	P	-	-	Y
Content-Type	826	O	-	-	-	[TS32.299]	UTF8String	V,M	P	-	-	N
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

| 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	
Current-Tariff	2056	M	-	M	-	[TS32.299]	Grouped	V,M	P	-	-	N
Delivery-Status	2104	O	-	-	-	[CHRG_DDS]	UTF8String	V,M	P	-	-	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
Expires	888	O	-	-	-	[TS32.299]	Unsigned32	V,M	P	-	-	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
IMS-Charging-Identifier	841	O	-	-	-	[TS32.299]	UTF8String	V,M	P	-	-	N
Incremental-Cost	2062	O	-	O	-	[TS32.299]	Grouped	V,M	P	-	-	N
Inter-Operator-Identifier	838	O	-	-	-	[TS32.299]	Grouped	V,M	P	-	-	N
Low-Balance-Indication	1290	-	-	O	-	[TS32.299]	Enumerated	M	P	-	V	Y
Message-Body	889	O	-	-	-	[TS32.299]	Grouped	V,M	P	-	-	N
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
Next-Tariff	2057	O	-	O	-	[TS32.299]	Grouped	V,M	P	-	-	N
Number-of-Messages-Successfully-Exploded	2111	O	-	-	-	[CHRG_DDS]	Unsigned32	V,M	P	-	-	N
Number-of-Messages-Successfully-Sent	2112	O	-	-	-	[CHRG_DDS]	Unsigned32	V,M	P	-	-	N
Number-of-Participants	885	O	-	-	-	[TS32.299]	Unsigned32	V,M	P	-	-	N
Originating-IOI	839	O	-	-	-	[TS32.299]	UTF8String	V,M	P	-	-	N
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
Originator	864	O	-	-	-	[TS32.299]	UTF8String	V,M	P	-	-	N
Participant-Group	1260	O	-	-	-	[TS32.299]	Grouped	V,M	P	-	-	N
PoC-Group-Name	859	O	-	-	-	[TS32.299]	UTF8String	V,M	P	-	-	N
PoC-Server-Role	883	O	-	-	-	[TS32.299]	Enumerated	V,M	P	-	-	Y
PoC-User-Role	1252	O	-	-	-	[TS32.299]	Grouped	V,M	P	-	-	Y
Preferred-AoC-Currency	2315	O	-	-	-	[TS32.299]	Unsigned32	V,M	P	-	-	N
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
Rate-Element	2058	O	-	O	-	[TS32.299]	Grouped	V,M	P	-	-	N
Rating-Group	432	O	O	O	O	[RFC4006]	Unsigned32	M	P	-	V	Y

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	
Reason-Code	2316	O	-	O	-	[TS32.299]	Enumerated	V,M	P	-	-	N
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
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
Scale-Factor	2059	O	-	O	-	[TS32.299]	Grouped	V,M	P	-	-	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
SIP-Method	824	O	-	-	-	[TS32.299]	UTF8String	V,M	P	-	-	N
SIP-Request-Timestamp	834	O	-	-	-	[TS32.299]	Time	V,M	P	-	-	N
SIP-Request-Timestamp-Fraction	2301	O	-	-	-	[TS32.299]	Unsigned32	V,M	P	-	-	N
SIP-Response-Timestamp	835	O	-	-	-	[TS32.299]	Time	V,M	P	-	-	N
SIP-Request-Timestamp-Fraction	2302	O	-	-	-	[TS32.299]	Unsigned32	V,M	P	-	-	N
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-Information	2060	O	-	O	-	[TS32.299]	Grouped	V,M	P	-	-	N
Tariff-Time-Change	451	-	-	O	-	[RFC4006]	Time	M	P	-	V	Y
Terminating-IOI	295	O	-	-	-	[RFC3588]	Enumerated	V,M	P	-	-	N
Time-Stamps	833	O	-	-	-	[TS32.299]	Grouped	V,M	P	-	-	N
Termination-Cause	295	O	-	-	-	[RFC3588]	Enumerated	M	P	-	V	N
Time-Quota-Threshold	868	-	-	-	O	[TS32.299]	Unsigned64	V,M	P	-	-	N
Trigger	1264	-	O	-	O	[TS32.299]	Grouped	V,M	P	-	-	N
Trigger-Type	870	-	O	-	O	[TS32.299]	Enumerated	V,M	P	-	-	N
Total-Number-of-Messages-Exploded	2113	O	-	-	-	[CHRG_DDS]	Unsigned32	V,M	P	-	-	Y
Total-Number-of-Messages-Sent	2114	O	-	-	-	[CHRG_DDS]	Unsigned32	V,M	P	-	-	Y
Unit-Cost	2061	O	-	O	-	[TS32.299]	Grouped	V,M	P	-	-	N
Unit-Quota-Threshold	1226	-	-	O	-	[TS32.299]	Unsigned32	V,M	P	-	-	N

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	
Unit-Value	445	O	M	O	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:

```
<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 SHALL uniquely identify a given Diameter credit-control service specific document.

The format of the Service-Context-Id is:

<div align="center">"extensions"."Release"."service-context" "@" "domain"</div>

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 SIMPLE IM charging: IM@openmobilealliance.org

8.1.5.4   Service-Information AVP

The Service-*Information* AVP (AVP code 873) is of type Grouped. It carries 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 [CHRG_DDS].

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.

8.2   Binding to Payment API

This section specifies how the OMA CH-2 interface MAY be exposed as a Web Service compliant with either the SOAP protocol binding of Parlay X Web Services Payment API as specified in [TS29.199-6] transferred to OMA [PSA RRP] or with the HTTP protocol binding of ParlayREST Web Services Payment API as specified in [REST TS Payment].

This mapping only covers part of the Charging Enabler's functionality.

8.2.1   Binding to Web Services SOAP Payment API used on CH-2

8.2.1.1   Interfaces and Operations

Charging Enabler Message Type	Payment API Interface/Operation
Debit Request	When decentralized rating is used: • Interface: AmountCharging Operation: ChargeAmount • Inclusion of rating parameters or service information except for 'description', 'currency', 'amount' and 'code' are not supported

	When centralized rating is used: • Interface: VolumeCharging Operation: ChargeVolume • Rating parameters and other service information may be included in the "parameters" part
Balance Check Request	\<Not Supported\>

Refund Request	When decentralized rating is used:
	
	• Interface: AmountCharging
	  Operation: RefundAmount
	• Inclusion of rating parameters or service information except for 'description', 'currency', 'amount' and 'code' are not supported
	
	When centralized rating is used:
	
	• Interface: VolumeCharging
	  Operation: RefundVolume
	• Rating parameters and other service information may be included in the "parameters" part

Price Enquiry Request	Interface: VolumeCharging Operation: GetAmount Rating parameters and other service information may be included in the "parameters" part

Initial Request	When decentralized rating is used:
	
	• Interface: ReserveAmountCharging
	  Operation: ReserveAmount
	• Inclusion of rating parameters or service information except for 'description', 'currency', 'amount' and 'code' are not supported
	
	When centralized rating is used:
	
	• Interface: ReserveVolumeCharging
	  Operation: ReserveVolume
	• Rating parameters and other service information may be included in the "parameters" part

Update Request	When decentralized rating is used:
	
	• For Requested Units (either addition or reduction)
	  Interface: ReserveAmountCharging
	  Operation: ReserveAdditionalAmount
	• For Used Units
	  Interface: ReserveAmountCharging
	  Operation: ChargeReservation
	• Inclusion of rating parameters or service information except for 'description', 'currency', 'amount' and 'code' are not supported

	When centralized rating is used:
	
	• For Requested Service Units (either addition or reduction)
	   Interface: ReserveVolumeCharging
	   Operation: ReserveAdditionalVolume
	• For Used Service Units
	   Interface: ReserveVolumeCharging
	   Operation: ChargeReservation
	• Rating parameters and other service information may be included in the "parameters" part

Termination Request	When decentralized rating is used:
	
	• For Used Units
	   Interface: ReserveAmountCharging
	   Operation: ChargeReservation
	• Inclusion of rating parameters or service information except for 'description', 'currency', 'amount' and 'code' are not supported
	• To terminate the session
	   Interface: ReserveVolumeCharging
	   Operation: ReleaseReservation
	
	When centralized rating is used:
	
	• For Used Service Units
	   Interface: ReserveVolumeCharging
	   Operation: ChargeReservation
	• Rating parameters and other service information may be included in the "parameters" part
	• To terminate the session
	   Interface: ReserveAmountCharging
	   Operation: ReleaseReservation

Table 12: Summary of Web Service Interfaces and Operations used on CH-2

8.2.1.2   Binding-specific Flows

In this section, an event charging flow, and session based charging flows related to the Web Service Binding are described.

8.2.1.2.1   Immediate Event Charging

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

Figure 23: Immediate Event Charging

1. **Service Request:** The user agent requests resource usage from the Charging Enabler User.
2. **Interface: VolumeCharging, Operation: ChargeVolume:** The operation is used to debit the subscriber's account.
3. **Service Delivery:** Service is being delivered.

8.2.1.2.2   Event Charging with Reservation

Figure 24: Event Charging with Reservation

1. **Service Request:** The user agent requests resource usage from the Charging Enabler User.
2. **Interface: ReserveVolumeCharging, Operation: ReserveVolume**: The operation is used to reserve service units from the subscriber's account
3. **Service Delivery:** Service is being delivered and simultaneously the Charging Enabler User monitors the consumption of the reserved units.
4. **Interface: ReserveVolumeCharging, Operation: ChargeReservation**: The operation is used to debit the used units from the subscriber's account.

     Interface: ReserveVolumeCharging, Operation: ReleaseReservation: The operation is used to release unused units and terminate the session.

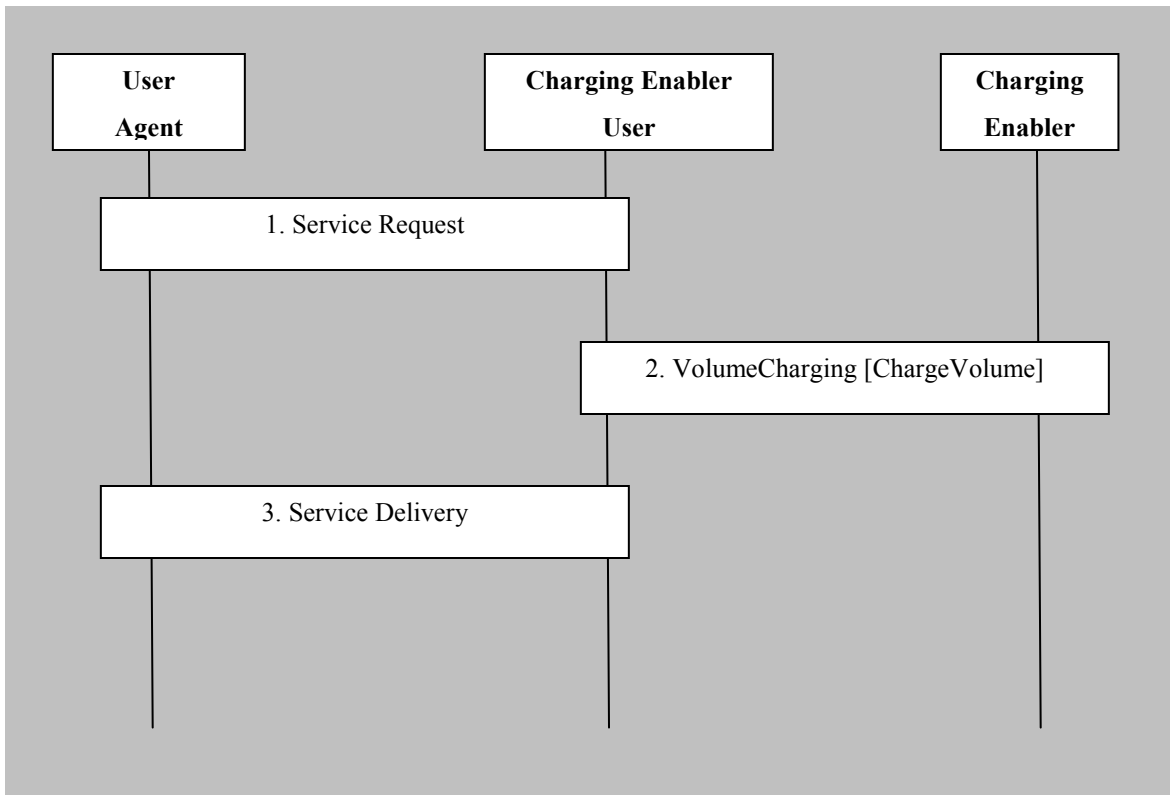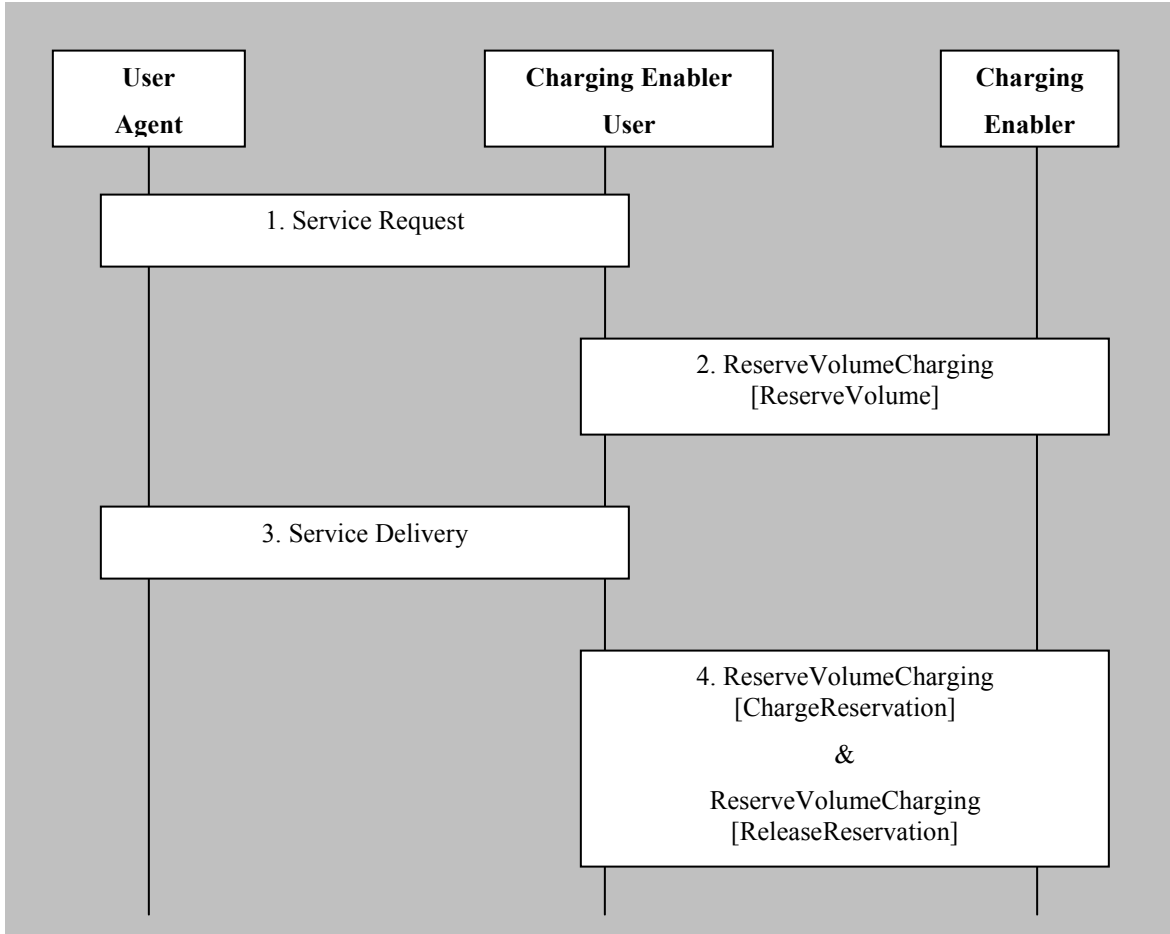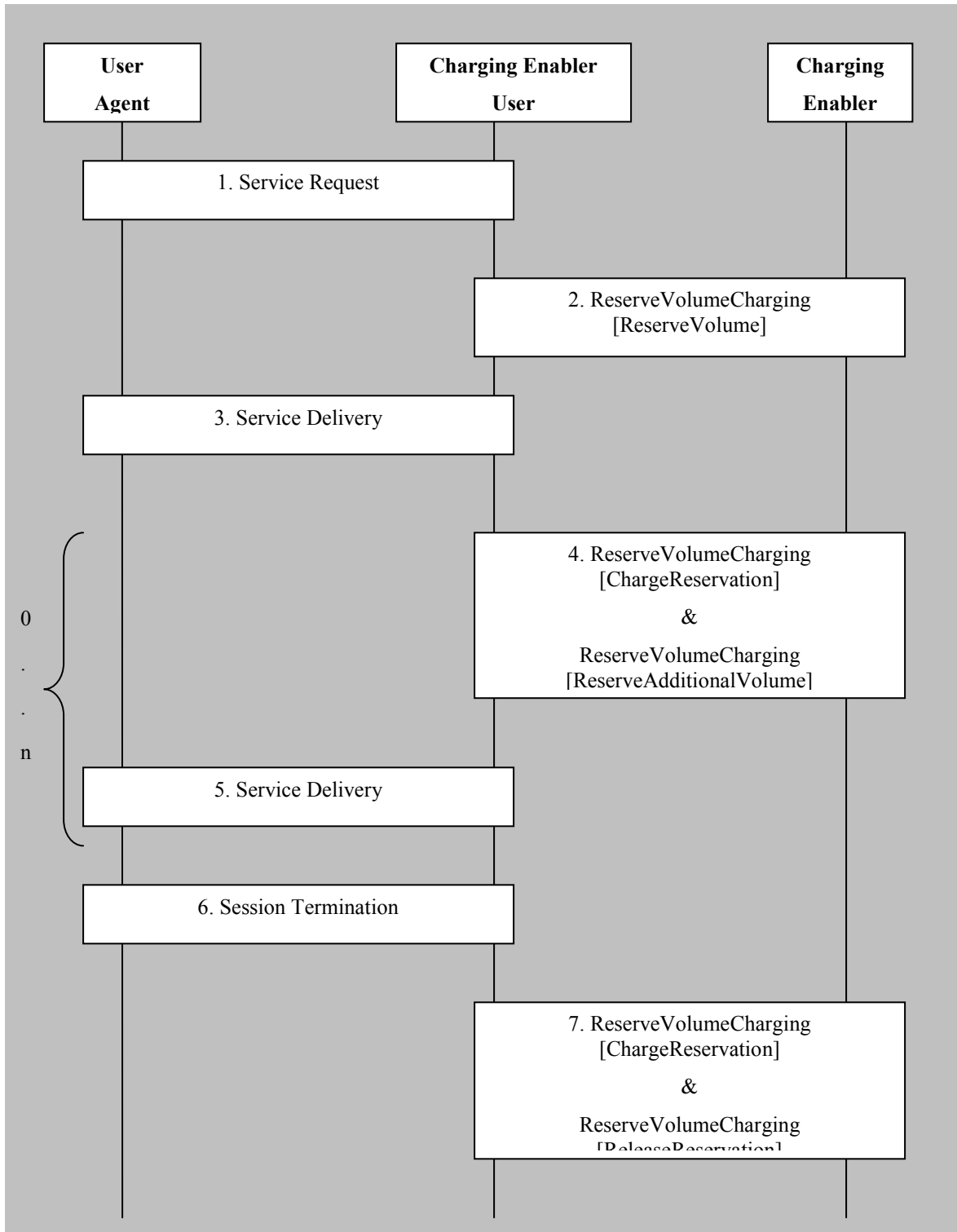### 8.2.1.2.3   Session Charging with Reservation

Figure 25: Session Charging with Reservation

1. **Service Request:** The user agent requests resource usage from the Charging Enabler User.
2. **Interface: ReserveVolumeCharging, Operation: ReserveVolume:** The operation is used to reserve units from the subscriber's account.
3. **Service Delivery:** Service delivery starts and simultaneously the Charging Enabler User monitors the consumption of the reserved units.
4. **Interface: ReserveVolumeCharging, Operation: ChargeReservation** The operation is used to debit the used units from the subscriber's account.
   Interface: ReserveVolumeCharging, Operation: ReserveAdditionalVolume The operation is used to reserve units from the subscriber's account.
   Note: In order to keep the state machine for the Parlay X binding compatible with the CH-2 specification, for Update Requests, the ReserveAdditionalVolume operation SHALL always be combined with a ChargeReservation operation.
5. **Service Delivery:** Service delivery continues and simultaneously the Charging Enabler User monitors the consumption of the reserved units. Step 4 and 5 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.
6. **Session Termination:** The session is terminated at the Charging Enabler User.

   Interface: ReserveVolumeCharging, Operation: ChargeReservation The operation is used to debit the used units from the subscriber's account.
   Interface: ReserveVolumeCharging, Operation: ReleaseReservation The operation is used to release not used units and to terminate the charging session.
   Note: In order to keep the state machine for the Parlay X binding compatible with the CH-2 specification, for Termination Requests, the ChargeReservation operation SHALL always be combined with a ReleaseReservation operation.

8.2.1.3   Mapping of OMA Charging Data Elements to Message Parts

The following table lists the OMA Charging Data Elements defined in the CH-2 base specification and the mapping of these elements to message parts in the Payment API messages.

As a general rule, any additional OMA Charging Data Elements created to convey charging information and listed in [CHRG_DDS] SHALL be mapped to the "parameters" part in the Payment API messages and SHALL use a parameter name derived from the name of the corresponding OMA Charging Data Element by removing spaces and starting all words with a capital letter except for the first word, for example Service Key -> serviceKey.

OMA Charging Data Element	Payment API Part Name
Input Octets	parameters:inputOctets
Money	charge:amount(Note 1)
Output Octets	parameters:outputOctets
Request Number	NOT USED
Service Specific Units	volume; additionally parameters:unit MAY indicate the unit of measure used, parameters:service and parameters:operation SHALL carry the necessary information on the service context needed to interpret the service specific units
Time	volume; additionally parameters:unit SHALL indicate a time unit
Total Octets	volume; additionally parameters:unit SHALL indicate "byte"
Check Balance Result	NOT SUPPORTED

OMA Charging Data Element	Payment API Part Name
Cost Information	result (result:amount, result:currency)
Cost Unit	result:description
Currency Code	charge:currency(Note 1)
Destination Host	parameters:destinationHost
Destination Realm	parameters:destinationRealm
Event Timestamp	parameters:eventTimestamp
Exponent	charge:amount(NOTE 1)
Multiple Services Credit Control	NOT SUPPORTED
Request Type	Indicated by using different Interfaces of the Web Service
Requested Action	Indicated by using different Operations of the Web Service Interfaces
Requested Service Unit	Indicated by using the relevant Input message types (ReserveAmountRequest, ReserveVolumeRequest, ReserveAdditionalAmountRequest, ReserveAdditionalVolumeRequest)
Result Code	Indicated with exceptions
Service Context Id	parameters:service
Service Identifier	parameters:operation
Session Id	referenceCode
Subscription Id	endUserIdentifier
Subscription Data	endUserIdentifier
Subscription Type	endUserIdentifier
Correlation Id	parameters:correlationId
Service Key	parameters:serviceKey
Termination Cause	parameters:terminationCause
Unit Value	charge:amount(Note 1)
Used Service Unit	Indicated by using the relevant Input message types (ChargeAmount, ChargeVolume, ChargeReservation)
User Equipment Info	parameters
User Equipment Info Type	parameters:userEquipmentInfoType
User Equipment Info Value	parameters:userEquipmentInfoValue
Value Digits	charge:amount(Note 1)

Note 1: Only used for "Amount Charging"

Table 13: Mapping to Web Services message part

8.2.2   Binding to RESTful http Payment API used on CH-2

8.2.2.1   Operations and Resources used on CH-2

Note: The common part of the resource URL is **http://{serverRoot}/{apiVersion}/payment/{endUserId}/transactions**

Charging Enabler Message Type	Payment API Operation/Resources
Debit Request	When decentralized rating is used: • http method: POST • TransactionOperationStatus: "Charged" • Resource URL: **../amount** • Inclusion of rating parameters or service information except for 'description', 'currency', 'amount' and 'code' are not supported When centralized rating is used: • http method: POST • TransactionOperationStatus: "Charged" • Resource URL: **../volume** • Rating parameters and other service information may be included in the "ratingParameter" part
Balance Check Request	\<Not Supported\>
Refund Request	When decentralized rating is used: • http method: POST • TransactionOperationStatus: "Refunded" • Resource URL: **../amount** • Inclusion of rating parameters or service information except for 'description', 'currency', 'amount' and 'code' are not supported When centralized rating is used: • http method: POST • TransactionOperationStatus: "Refunded" • Resource URL: **../volume** • Rating parameters and other service information may be included in the "ratingParameter" part
Price Enquiry Request	\<Not Supported\>
Initial Request	When decentralized rating is used: • http method: POST • TransactionOperationStatus: "Reserved" • Resource URL: **../amountReservation** • referenceSequence: 1 • Inclusion of rating parameters or service information except for 'description', 'currency', 'amount' and 'code' are not supported When centralized rating is used: • http method: POST • TransactionOperationStatus: "Reserved"

	• Resource URL: **../volumeReservation** • referenceSequence: 1 • Rating parameters and other service information may be included in the "ratingParameter" part

Update Request	When decentralized rating is used:
	    For the Used Units:
	    • http method: POST
	    • TransactionOperationStatus: "Charged"
	    • Resource URL: **../amountReservation**
	    • referenceSequence: 2 (dependend on the number of update requests)
	
	    For additionally Requested Service Units:
	    • http method: POST
	    • TransactionOperationStatus: "Reserved"
	    • Resource URL: **../amountReservation**
	    • referenceSequence: 3 (dependend on the number of update requests)
	    • Inclusion of rating parameters or service information except for 'description', 'currency', 'amount' and 'code' are not supported
	
	When centralized rating is used:
	    For the Used Units:
	    • http method: POST
	    • TransactionOperationStatus: "Charged"
	    • Resource URL: **../volumeReservation**
	    • referenceSequence: 2 (dependend on the number of update requests)
	
	    For additionally Requested Service Units:
	    • http method: POST
	    • TransactionOperationStatus: "Reserved"
	    • Resource URL: **../ volumeReservation**
	    • referenceSequence: 3 (dependend on the number of update requests)
	    • Rating parameters and other service information may be included in the "ratingParameter" part

Termination Request	When decentralized rating is used:
	    • For Used Units
	      http method: POST
	      TransactionOperationStatus: "Charged"
	      Resource URL: **../amountReservation**
	    • referenceSequence: 4 (dependend on the number of update requests)
	
	    • Inclusion of rating parameters or service information except for 'description', 'currency', 'amount' and 'code' are not supported
	
	    • To terminate the session
	      http method: POST

	TransactionOperationStatus: "Released"
	Resource URL: **../ amountReservation**
	• referenceSequence: 5 (dependend on the number of update requests)
	
	When centralized rating is used:
	• For Used Service Units
	  http method: POST
	  TransactionOperationStatus: "Charged"
	  Resource URL: **../volumeReservation**
	• referenceSequence: 4 (dependend on the number of update requests)
	• Rating parameters and other service information may be included in the "ratingParameter" part
	• To terminate the session
	  http method: POST
	  TransactionOperationStatus: "Released"
	  Resource URL: **../volumeReservation**
	• referenceSequence: 5 (dependend on the number of update requests)

Table 14: Summary of REST Operations and Resources used on CH-2

8.2.2.2   Binding-specific Flows

In this section, an event charging flow, and session based charging flows related to the RESTful Binding are described.

8.2.2.2.1   Immediate Event Charging

Event charging flow is used for one time event charging requests, otherwise, session charging will be used.
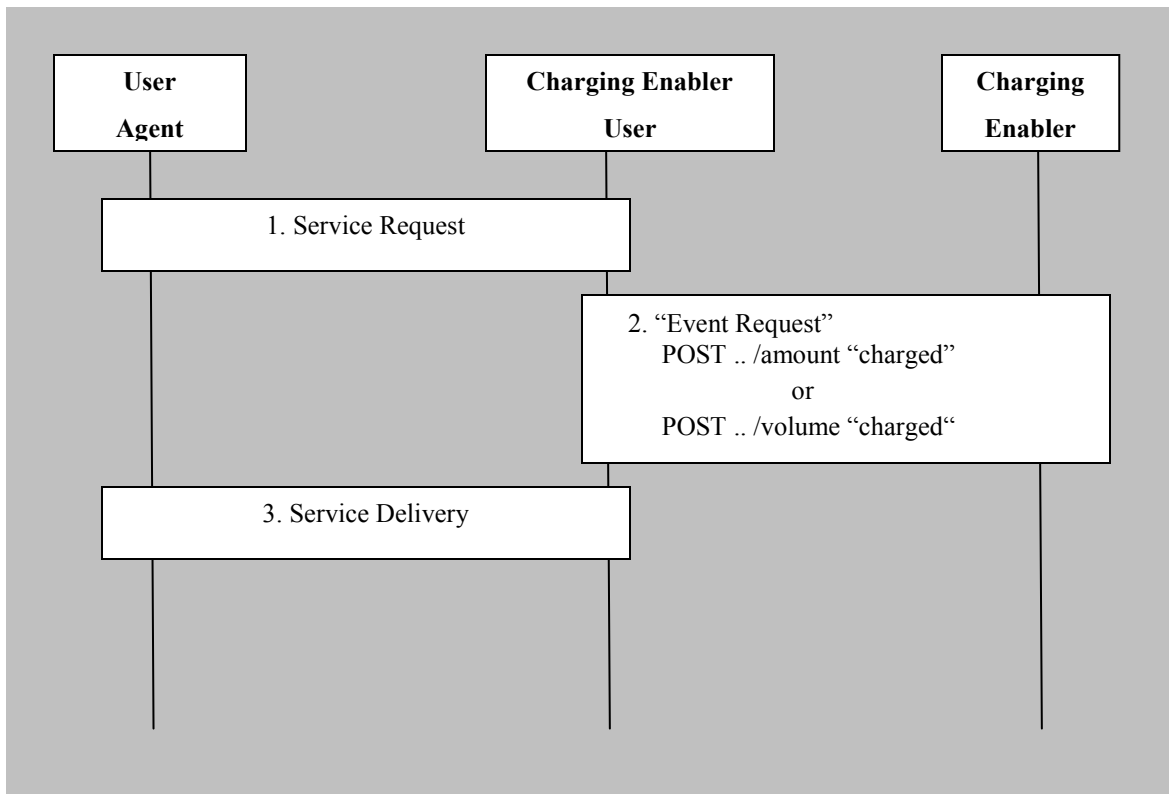
Figure 26: Immediate Event Charging

1. **Service Request:** The user agent requests resource usage from the Charging Enabler User.
2. The Charging Enabler User sends an "**Event Request**" using **http POST to either**
    resource: http://{serverRoot}/{apiVersion}/payment/{endUserId}/transactions/amount
    or
    resource: http://{serverRoot}/{apiVersion}/payment/{endUserId}/transactions/volume
    with TransactionOperationStatus set to "**charged**" to the Charging Enabler. The operation is used to debit the subscriber's account.
3. **Service Delivery:** Service is being delivered.

8.2.2.2.2   Event Charging with Reservation

Figure 27: Event Charging with Reservation

1. **Service Request:** The user agent requests resource usage from the Charging Enabler User.
2. The Charging Enabler User sends an "**Initial Request**" using **http POST to either**
    resource: http://{serverRoot}/{apiVersion}/payment/{endUserId}/transactions/amountReservation
    or
    resource: http://{serverRoot}/{apiVersion}/payment/{endUserId}/transactions/volumeReservation
    with TransactionOperationStatus set to "**reserved**" to the Charging Enabler.
    The operation is used to reserve service units from the subscriber's account
3. **Service Delivery:** Service is being delivered and simultaneously the Charging Enabler User monitors the consumption of the reserved units.
4. The Charging Enabler User sends an "**Termination Request**", i.e.by using combined operations
    http POST to either
    resource: http://{serverRoot}/{apiVersion}/payment/{endUserId}/transactions/amountReservation
    or
    resource: http://{serverRoot}/{apiVersion}/payment/{endUserId}/transactions/volumeReservation
    with TransactionOperationStatus set to "**charged**" to the Charging Enabler.
    This, first operation, is used to debit the used units from the subscriber's account.

and **http POST to either**

resource: http://{serverRoot}/{apiVersion}/payment/{endUserId}/transactions/amountReservation
or
resource: http://{serverRoot}/{apiVersion}/payment/{endUserId}/transactions/volumeReservation

with TransactionOperationStatus set to "**released**" to the Charging Enabler.

This, second operation, is used to release unused units and terminate the session.

8.2.2.2.3 Session Charging with Reservation

User Agent	Charging Enabler User	Charging Enabler

1. Service Request

2. "Initial Request"
   POST .. /amountReservation "reserved"
   or
   POST .. /volumeReservation "reserved"

3. Service Delivery

4. "Update Request"
   POST .. /amountReservation "charged"
   or
   POST .. /volumeReservation "charged"
   &
   POST .. /amountReservation "reserved"
   or
   POST .. /volumeReservation "reserved"

0
.
.
n

5. Service Delivery

6. Session Termination

7. "Termination Request"
   POST .. /amountReservation "charged"
   or
   POST .. /volumeReservation "charged"
   &
   POST .. /amountReservation "released"
   or
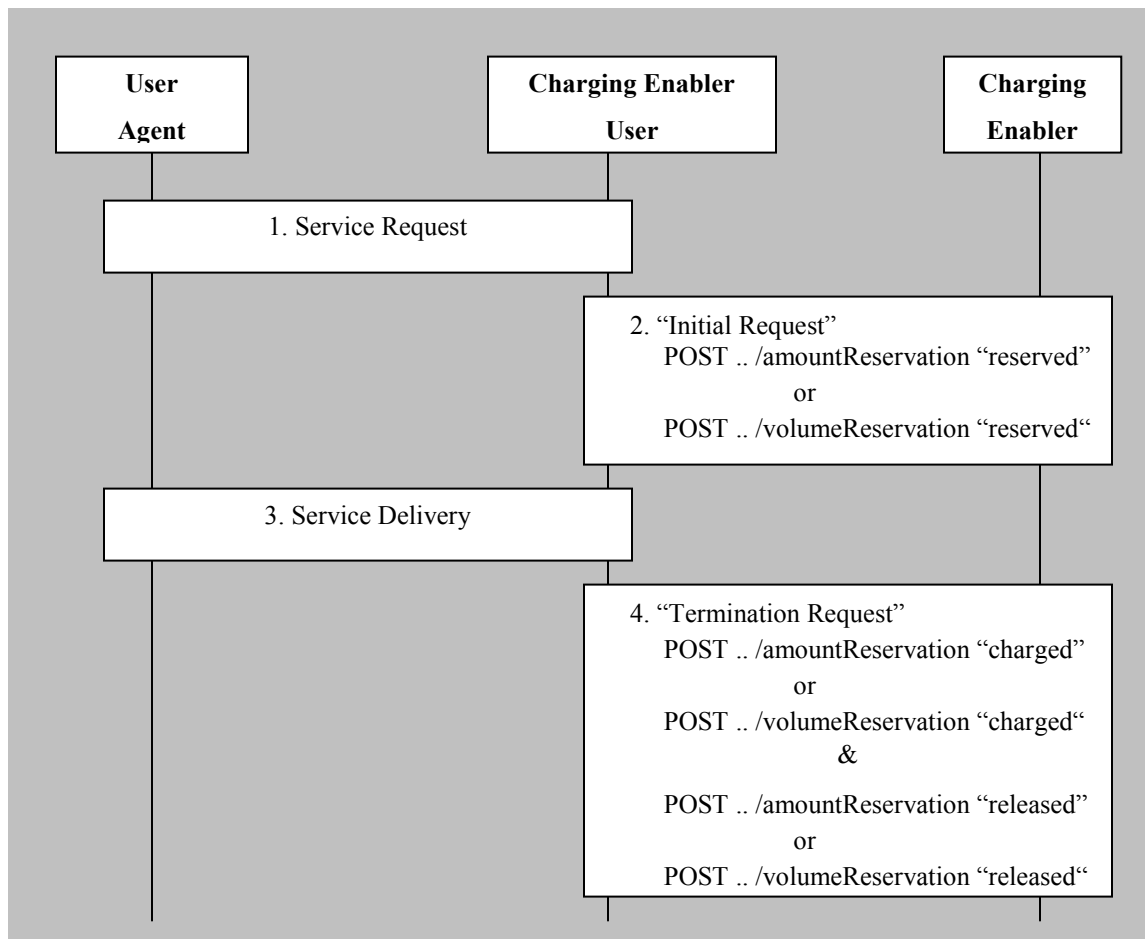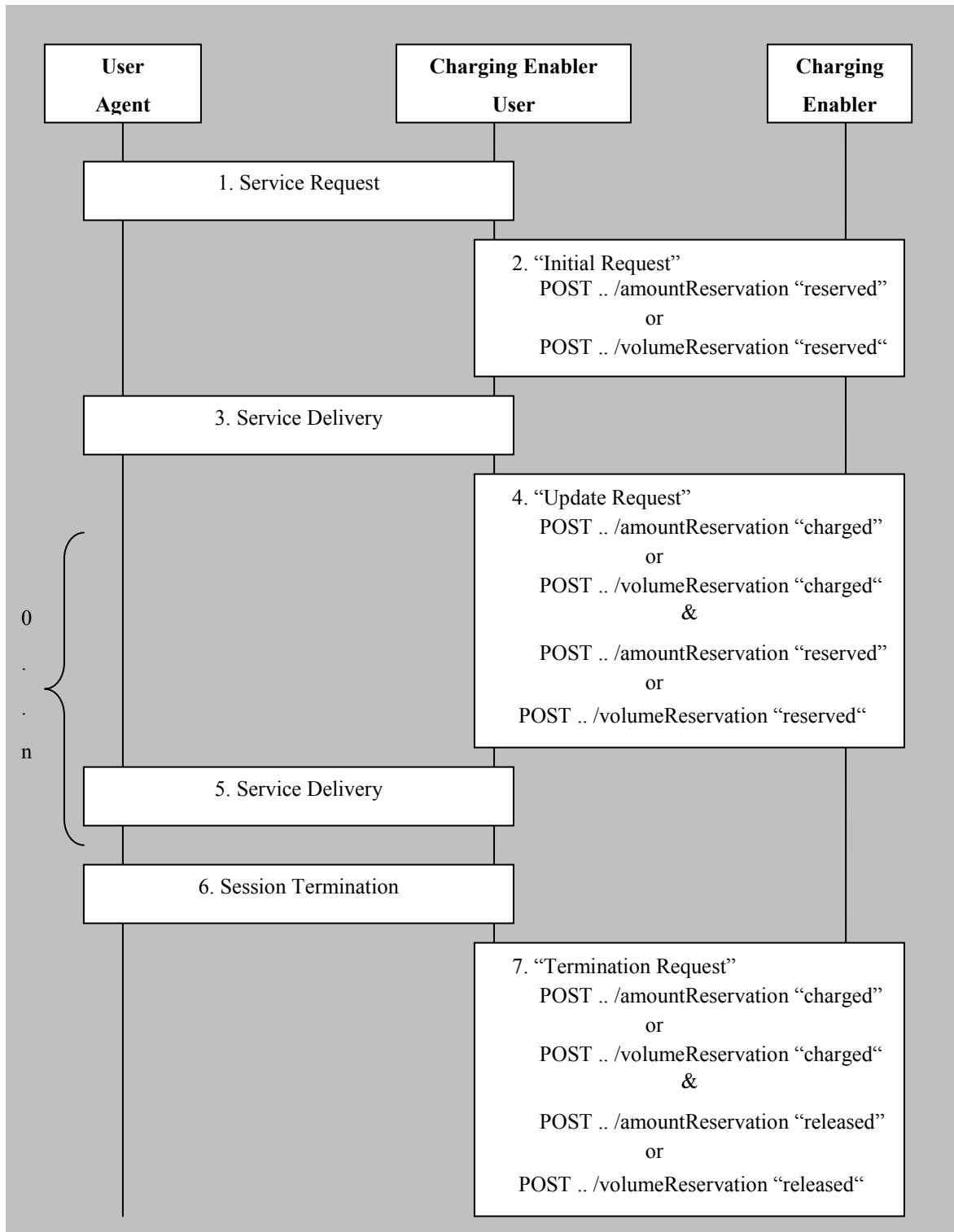   POST .. /volumeReservation "released"

Figure 28: Session Charging with Reservation

1. **Service Request:** The user agent requests resource usage from the Charging Enabler User.
2. The Charging Enabler User sends an "**Initial Request**" using **http POST to either**

   resource: http://{serverRoot}/{apiVersion}/payment/{endUserId}/transactions/amountReservation
   or

   resource: http://{serverRoot}/{apiVersion}/payment/{endUserId}/transactions/volumeReservation

   with TransactionOperationStatus set to "**reserved**" to the Charging Enabler.

   The operation is used to reserve service units from the subscriber's account
3. **Service Delivery:** Service delivery starts and simultaneously the Charging Enabler User monitors the consumption of the reserved units.
4. The Charging Enabler User sends an "**Update Request**", i.e. by using combined operations

   http POST to either

   resource: http://{serverRoot}/{apiVersion}/payment/{endUserId}/transactions/amountReservation
   or

   resource: http://{serverRoot}/{apiVersion}/payment/{endUserId}/transactions/volumeReservation

   with TransactionOperationStatus set to "**charged**" to the Charging Enabler.

   This, first operation, is used to debit the used units from the subscriber's account.

   and **http POST to either**

   resource: http://{serverRoot}/{apiVersion}/payment/{endUserId}/transactions/amountReservation
   or

   resource: http://{serverRoot}/{apiVersion}/payment/{endUserId}/transactions/volumeReservation

   with TransactionOperationStatus set to "**reserved**" to the Charging Enabler.

   This, second operation, is used to reserve units from the subscriber's account.
5. **Service Delivery:** Service delivery continues and simultaneously the Charging Enabler User monitors the consumption of the reserved units. Step 4 and 5 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.
6. **Session Termination:** The session is terminated at the Charging Enabler User.
7. The Charging Enabler User sends an "**Termination Request**",. i.e.by using combined operations

   http POST to either

   resource: http://{serverRoot}/{apiVersion}/payment/{endUserId}/transactions/amountReservation
   or

   resource: http://{serverRoot}/{apiVersion}/payment/{endUserId}/transactions/volumeReservation

   with TransactionOperationStatus set to "**charged**" to the Charging Enabler.

   This, first operation, is used to debit the used units from the subscriber's account.

   and **http POST to either**

   resource: http://{serverRoot}/{apiVersion}/payment/{endUserId}/transactions/amountReservation
   or

   resource: http://{serverRoot}/{apiVersion}/payment/{endUserId}/transactions/volumeReservation

   with TransactionOperationStatus set to "**released**" to the Charging Enabler.

   This, second operation, is used to release unused units and terminate the session.

8.2.2.3   Mapping of OMA Charging Data Elements to Message Parts

The following table lists the OMA Charging Data Elements defined in the CH-2 base specification and the mapping of these elements to message parts in the Payment API messages.

As a general rule, any additional OMA Charging Data Elements created to convey charging information and listed in [CHRG_DDS] SHALL be mapped to the "ratingParameters" part in the Payment API messages and SHALL use a parameter name derived from the name of the corresponding OMA Charging Data Element by removing spaces and starting all words with a capital letter except for the first word, for example Service Key -> serviceKey.

OMA Charging Data Element	REST Type Element
Check Balance Result	NOT SUPPORTED
Correlation Id	ratingParameter:correlationId
Cost Information	result (result:amount, result:currency)
Cost Unit	result:description
Currency Code	charge:currency
Destination Host	ratingParameter:destinationHost
Destination Realm	ratingParameter:destinationRealm
Event Timestamp	ratingParameter:eventTimestamp
Exponent	charge:amount
Input Octets	ratingParameter:inputOctets
Money	charge:amount (NOTE 1)
Multiple Services Credit Control	NOT SUPPORTED
Output Octets	ratingParameter:outputOctets
Request Type	Indicated by using different Interfaces of the Web Service
Requested Action	Indicated by using different Operations of the Web Service Interfaces
Requested Service Unit	Indicated by using the relevant Input message types (ReserveAmountRequest, ReserveVolumeRequest, ReserveAdditionalAmountRequest, ReserveAdditionalVolumeRequest)
Request Number	Indicated by using different resources and TransactionOperationStatus parameter
Result Code	Indicated with exceptions
Service Context Id	ratingParameter:service
Service Identifier	ratingParameter:operation
Service Key	ratingParameter:serviceKey
Service Specific Units	volume; additionally ratingParameter:unit MAY indicate the unit of measure used, ratingParameter:service and ratingParameter:operation SHALL carry the necessary information on the service context needed to interpret the service specific units
Session Id	referenceCode
Subscription Data	endUserIdentifier
Subscription Id	endUserIdentifier
Subscription Type	endUserIdentifier
Termination Cause	ratingParameter:terminationCause
Time	volume; additionally ratingParameter:unit SHALL indicate a time unit

OMA Charging Data Element	REST Type Element
Total Octets	volume; additionally ratingParameter:unit SHALL indicate "byte"
Unit Value	charge:amount (NOTE 1)
Used Service Unit	Indicated by using the relevant Input message types (ChargeAmount, ChargeVolume, ChargeReservation)
User Equipment Info	NOT USED
User Equipment Info Type	ratingParameter:userEquipmentInfoType
User Equipment Info Value	ratingParameter:userEquipmentInfoValue
Value Digits	charge:amount (NOTE 1)

NOTE 1: Only used for "Amount Charging", i.e. resource URL: …/amount

Table 15: Mapping to REST Type Element parts

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 1.1 History

Document Identifier	Date	Sections	Description
Draft Versions OMA-TS-Charging_Online-V1_1	12 Jun 2007	Whole document.	Initial revision based on version 1.0
	29 Sep 2007	3.2; 3.3; 6.2; 8.1.3.1; 8.1.4; 8.1.5	OMA-MCC-2007-0078R01 OMA-MCC-2007-0103R01
	25 Feb 2008	6.2; 8.2	OMA-MCC-2007-0116R02 OMA-MCC-2007-0117R01 OMA-MCC-2007-0139
	24 Jun 2008	2.1, 3.3, 7.5, 8.1.4, 8.1.5.4,	OMA-MCC-2008-0037 OMA-MCC-2008-0050
	22 Aug 2008	1-7	OMA-MCC-2008-0075
	23 Oct 2008	3.2, 3.2 6.1, 6.2 7.5, 8.1.3 8.1.4, 8.2.4	OMA-MCC-2008-0079R01 OMA-MCC-2008-0082R01 OMA-MCC-2008-0085R01 OMA-MCC-2008-0092
	16 Dec 2008	1., 7.3.7.2 8.1.2, 8.2.23	OMA-MCC-2008-0110R01
Candidate Version OMA-TS-Charging_Online-V1_1	13 Feb 2009	n/a	Status changed by TP TP ref# OMA-TP-2009-0062- INP_Charging_V1_1_ERP_for_Candidate_Approval
Draft Version OMA-TS-Charging_Online-V1_1	16 Jun 2009	6.1, 6.2 8.1.3.1, 8.1.3.2 8.1.4, 8.1.5	Implemented agreed change: OMA-MCC-2009-0021R02- CR_Parameter_cleansing_in_Online_Charging
Candidate Version OMA-TS-Charging_Online-V1_1	28 Jul 2009	All	Status changed to Candidate by TP: OMA-TP-2009-0320- INP_Charging_V1_1_ERP_for_Candidate_re_Approval

Draft Versions:
OMA-TS-Charging_Online-V1_1
	15 Jun 2010	6.1, 6.2
		7.5
		8.1.3.1
		8.1.4, 8.1.5
			Implemented agreed change:
			  OMA-ARC-MCC-2010-0004R03-
			CR_Clearing_of_inconsistencies_in_Online_Charging_for_AoC
			  OMA-MCC-2010-0007-CR_ Updates for Online Charging
			Editorial fix: 2010 template applied

	16 Jul 2010	2.1, 7,2, 8.2
		8.2.2, 8.2.3, 8.2.4
			Implemented agreed change:
			  OMA-MCC-2010-0009R01-CR_Correction on Payment API usaege
			  OMA-ARC-MCC-2010-0012R01-
			CR_Binding_to_Payment_API_in_Online_Charging
			  OMA-ARC-MCC-2010-0013R01-
			CR_Correction_on_Session_based_Online_Charging

	20 Sep 2010	8.2	Implemented agreed change: OMA-ARC-MCC-2010-0015R01- CR_Binding_to_REST_Payment_API_in_Online_Charging
	21 Sep 2010	8.1, 8.2	Implementation of above CR fixed and edits
Candidate Version OMA-TS-Charging_Online-V1_1	01 Oct 2010	All	Status changed to Candidate by TP: OMA-TP-2010-0429-INP_Charging_V1_1_ERP_for_Notification

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-based 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-based 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	

B.2.2   Event-based 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-based 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	