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Charging Architecture
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1. Scope (Informative)

For the growth of the mobile service market, it is important to facilitate the deployment of various kinds of new applications. Charging has been determined to be an important and necessary enabler for all these new applications.

Applications can be provided by third parties, either within or outside the trusted domain of an infrastructure provider. Easy, flexible and secure charging for service provider applications that reside outside an infrastructure provider's trusted domain is thought to be particularly important for realizing new market opportunities.

This document defines the architecture to enable charging for applications that use OMA enablers, both inside and outside of the trusted domain of the infrastructure provider.

OMA's Charging Enabler follows the OSE principles and coordinates the charging data triggers, and flow from OMA enablers or other resources into an underlying charging infrastructure. The charging architecture supports not only legacy charging for network resources, but also new charging types triggered by OMA enablers or other resources. The requirements for these charging primitives/mechanisms must be applicable to any offered mobile service that is commercially deployed.

Defining the architecture for charging of services which are not defined by OMA (e.g. 3GPP/2 services) is outside the scope of this document. These services include but are not limited to voice calls and SMS, IP access in 2.5G and WLAN/Wi-Fi [1] as well as charging for access and IMS session in 3G.

Solutions covered by this architecture document are not limited to communicate with a 3GPP/2 network, although it will be the first objective to manage interoperability between OMA, and 3GPP/2 in charging. This work aims to shrink the gap between standards, products and implementations. For further clarification, and in any uncertainties, please refer to the charging worksplit agreement between the OMA and 3GPP/2 laid out in [CHRG_WRKSPLT].

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2. References

2.1 Normative References

[CHRG_RD]	"Charging Requirements", Open Mobile Alliance™, OMA-RD_Charging-V1_0, URL: http://www.openmobilealliance.org/
[OSE]	"OMA Service Environment", Open Mobile Alliance™, OMA-RD-Architecture-V1_0_2-20070202-A, OMA-AD-Service_Environment-V1_0_4-20070201-A, 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

2.2 Informative References

[CHRG_WRKSPLT]	"White Paper on Charging Worksplit", Open Mobile Alliance™, OMA-WP-Charging-Worksplit-V1_0, URL: http: //www.openmobilealliance.org/
[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

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.
Account Management	Maintaining accounts, where an account is a record of debit and credit transactions. See also *Charging Account.*
Advice of Charge	See [OMA-DICT].
Aggregation	Combining charging information for the same session, typically over a time period.
Application	See [OMA-DICT]
Authorization	The act of determining whether something or someone will be granted access to a resource.
Charging	See [OMA-DICT]
Charging Enabler	A set of functions that enable other OMA enablers, applications, or other resources to charge service users.
Charging Enabler Implementation	A physical implementation of the functions defined by the Charging Enabler in order to enable other OMA enabler implementations, or applications, to charge service users. The implementation may consist of one or more physical entities, each implementing one or more of the functions. Some of the implementation entities may be based on definitions by organisations other than OMA, e.g. 3GPP/2.
Chargeable Event	See [OMA-DICT]
Charging Account	See [OMA-DICT]
Charging Aggregation	See Aggregation.
Charging Correlation	See Correlation.
Charging Enabler User	A *Charging Enabler User* invokes and interacts with the Charging Enabler.
Charging Event	A set of charging information sent by the Charging Enabler User for further processing.
Charging Infrastructure	This term denotes any infrastructure that maintains the Charging Accounts.
Correlation	Making a connection or relationship between Charging Events that belong to the same service, but may not be in the same session.
Interface	See [OMA-DICT].
Offline Charging	See [OMA-DICT].
Online Charging	See [OMA-DICT].
Quota	A prescribed number or share of service units generally associed with service usage. (E.g. a

maximum amount of credits, time or volume for use of a service.)

Quota Management   Determination and allocation of a quota granted to a Charging Enabler User prior to providing a service based on the quota.

Rating   The function of determining the price or value of individual Charging Events.

Resource   Any component, enabler, function or application that can receive and process requests.

3.3 Abbreviations

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

3G	3rd Generation
3GPP	3rd Generation Partnership Project
3GPP/2	3GPP and 3GPP2
3GPP2	3rd Generation Partnership Project 2
AAA	Authentication, Authorization and Accounting
AD	Architecture Document
AoC	Advice of Charge
HSS	Home Subscriber Server
IMS	IP Multimedia System
IP	Internet Protocol
OMA	Open Mobile Alliance
OSE	OMA Service Environment
PoC	Push-to-Talk over Cellular
RD	Requirements Document
RFC	Request for Comments
SMS	Short Message Service
Wi-Fi®[2]	Wireless Fidelity
WLAN	Wireless Local Area Network

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4. Introduction   (Informative)

This Charging Architecture Document (AD) describes the features and architecture of the Charging Enabler. It gives a high level overview of how charging can be used by other OMA enablers, and by external bodies such as 3GPP and 3GPP2, which develop related standards concerning charging.

This Architecture Document focuses on providing an overview of charging as a set of logical functions as seen by its users. It should be noted that the charging function can be implemented in various ways that may differ significantly from each other. Some possible implementation and deployment alternatives are discussed in other Charging Enabler documents.

To ensure the use of coherent terminology and consistent architectural mapping, other OMA working groups are encouraged to use the Charging AD as a baseline when defining how their enablers or service interface with charging. The high level charging requirements are defined in the Charging RD [CHRG_RD]. However, the purpose of the Charging RD and AD is not to mandate if and how other OMA enablers should support charging. It is the responsibility of each OMA working group to define their enabler or service specific charging requirements.

From the Charging Enabler User's point of view, charging can be supported either by means of online or offline charging (or both).

4.1   Version 1.0

Charging Enabler version 1.0 was the first release of the OMA Charging Enabler, and is approved.

4.2   Version 1.1

Enhancements of Charging Enabler version 1.1 affect the Architecture Document (AD) by way of addition of definition for the concept of Third-Party-Charging and AoC.

5. Architectural Model

5.1   Dependencies   (Informative)

The OMA Charging Enabler enables charging for various types of Chargeable Events to a subscriber's account, possibly maintained by an underlying Charging Infrastructure. The Charging Enabler is not a Charging Infrastructure in its own right but a facilitator in the process of providing charging at the application and OMA enabler level.

The Charging Enabler's architecture follows the principles of the OSE [OSE], and builds on existing charging architectures which have already defined models for charging. The enabler is also extensible to other network architectures supporting application and service driven requirements but may rely on a different set of environmental assumptions.

The value delivered by the OMA Charging Enabler with respect to other service providers relates to the enabling of new business models and entities that can benefit from open, standardized access to Charging Events generated in an OSE domain.

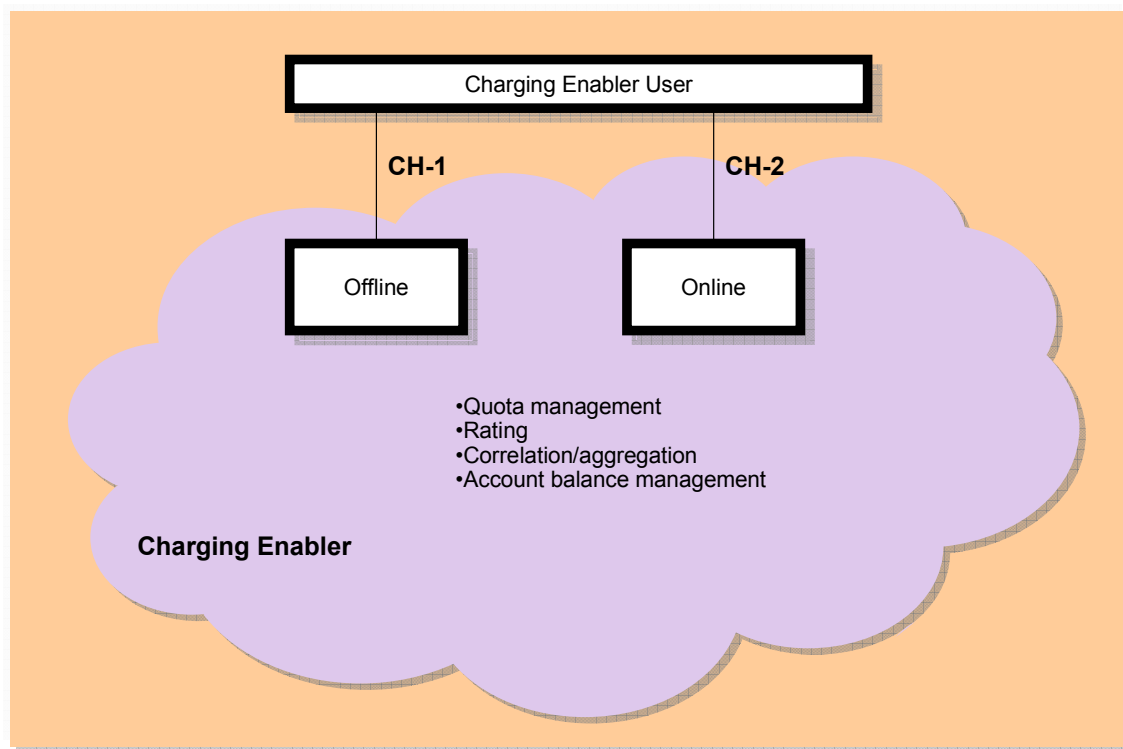## 5.2   Architectural Diagram

Figure 1: Charging Enabler Functional Architecure

Figure 1 shows the functional architecture of the Charging Enabler. The Charging Enabler supports both online and offline charging methods. For either method, any of the charging functions listed may be applied by the Charging Enabler. The charging functions are described in detail in section 5.3. Methods that can be used to determine whether to use online or offline charging are described in Chapter 6.1.

The flow of Charging Events is such that they are generated by a Charging Enabler User as the result of a user consuming a service. The event will then be processed and potentially modified by some combination of the charging functions.

This functional architecture applies to both online and offline charging.

5.3   Functional Components

This section describes the main functional components comprising the Charging Enabler. Any Charging Enabler User issuing a request to the Charging Enabler will first be authorized to use the Charging Enabler.

5.3.1   Quota Management

The Quota Management function is responsible for allocating and granting quotas of service usage that a particular user may engage. The Quota Management function can calculate quotas based on the information available e.g. rate, type of service, account status, user and infrastructure provider/service provider rules or policies. The metrics specified within a quota, such as usage volume or session duration, are based on what is appropriate to the particular service.

A Charging Enabler User that is granted a quota from the Quota Management function is responsible for ensuring that the service usage does not exceed the quota, or in some cases, may request additional quotas. Quotas that are exceeded may lead to revenue loss by the service provider.

5.3.2   Correlation/Aggregation

Aggregation is the association of Charging Events generated by the same entity over a period of time.

Correlation could occur between the Charging Events generated by different entities while they are collaboratively providing a single service. The correlation function provides an association of events for the user/application that will be charged.

5.3.3   Rating

This function computes the price or value of a Charging Event indicating a particular action performed by a service. A price or value can be expressed in monetary or non-monetary units (e.g. in some currency or loyalty points).

The rating function receives details of the event to be rated (i.e. the Chargeable Event). The determination of the price or value of the event may be based on one or several attributes of the Charging Event (for example measures of volume, start and end time, or type of service accessed), or on other context factors (for example, information related to the account which is to be charged). Apart from the event-specific input, the rating function applies a set of pre-configured rules, usually called a rate plan, to determine the value of the event.

5.3.4   Account Balance Management

For Charging Events of a particular subscriber, the Account Balance Management function determines whether credit will be granted for service usage. These Charging Events will be rated at some point in time and eventually compared with the account balance of the user/application in order to authorize the execution of the requested service. Account Balance Management will perform credit authorization, e.g. check the following conditions (list not mandatory, nor exhaustive):

- The service provider has enabled the Charging Enabler functionality

- The subscriber is known to the Charging Enabler instance

- The subscriber has sufficient credit, and has not exceeded any spending limits configured for him

- The subscriber has not prohibited the Charging Enabler User that issued the Charging Event (e.g. service barring)

- The subscriber has given an explicit, interactive confirmation (user consent) for the particular request, or has given advance consent to be charged.

In turn, once the charging transaction is completed, it will eventually be recorded by the account balance management function. The recorded events result in an update to the subscriber's Charging Account balance.

5.4   Interfaces

The details of the interfaces below are not within the scope of the AD and will be found in protocol specifications of the Charging Enabler.

5.4.1   Offline Charging Interface (CH-1)

This interface is used for offline Charging Event reporting. This interface supports the following functions:

- The sending of Charging Events after service delivery

- The sending of interim Charging Events during service delivery

- Correlation.

5.4.2   Online Charging Interface (CH-2)

This interface is used for online charging. This interface supports the following functions:

- Quota requests

- Renewed quota requests

- Reporting of portion of unused quota

- Rating

- Credit checking

- Correlation

- Refunding facility.

6. Flows

Depending on the charging method used (online/offline) the flows are different. These different flows are described below on a generic level.

6.1   Offline/Online Determination

If the Charging Enabler User does not already know whether online or offline charging should be used, the online/offline determination can be achieved by various methods.

One method is to fetch this information with a query towards an entity that holds the information (e.g. AAA server, HSS). This mechanism is out of scope for the Charging Enabler.

Another method is to try online first initiating an online session towards the Charging Enabler. If the request is successful then online charging is used. If the Charging Enabler User receives a reply with a specific error code, then the Charging Enabler User will use offline.

Implementations may use these or other methods for the offline/online determination.

6.2   Offline

A Charging Enabler may receive a request at the start of a Chargeable Event. After reception of a request at the start it may receive none, one or several interim requests, at intervals, until the Chargeable Event has stopped at which time the Charging Enabler will receive a stop request.The Charging Enabler may also only receive one request if start and stop of a Chargeable Event could be considered simultaneous.

Rating, account balance management and correlation/aggregation functions may be invoked as necessary to fulfill the steps above.

In an example scenario where a request for resource usage is made by a service consumer and resource/service is allowed by the Charging Enabler User, the following exchange may occur:

1. Resource usage information is generated and transferred to the Charging Enabler for charging purposes

2. The received resource usage information is rated

Based on step 2 above, charging information is recorded on the subscribers account

6.3   Online

A Charging Enabler shall receive a first request for quota before a Chargeable Event will start. After responding with the quota granted it may receive none, one or more intermediate requests for quota until the Chargeable Event has stopped. A request for quota may be combined with a report of used quota. When the Chargeable Event has stopped the Charging Enabler shall receive a final request with the used quota.

The Charging Enabler may instead of the above also only receive one request with the used quota.

Rating, account balance management, Quota Management and correlation/aggregation functions may be invoked as necessary to fulfill the steps above. The invocation of the functions may be repeated to fulfill handling of intermediate requests.

In an example scenario where a request for resource usage is made by a service consumer and resource/service is allowed by the Charging Enabler User, the following exchange may occur:

1. Based on the resource/service usage request, the request is rated into corresponding service units.

2. The account balance management performs credit check and reservation based on the rated amount.

3. The quota and/or credit authorization is communicated back to the Charging Enabler User.

4. [Optional] Along with the credit authorisation, the Charging Enabler may return the AoC information pertinent to the service usage request. It is up to the service enabler to decide the relevance and delivery of the AoC information to the client.

5. Service is delivered.

6. When the service is terminated, or quota is depleted, the usage quota is reported back to the Charging Enabler.

7. Units corresponding to the used quota are committed to the subscriber's account.

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-AD_Charging-V1_1	12 Jun 2007	All	Initial draft based on version 1.0
	29 Sep 2007	3.2, 3.3	OMA-MCC-2007-0060R02
	17 Apr 2008	2.2, 4, 6.3	– Editorial clean-up for Charging 1.1 review. – Addition of the AoC feature to section 6.3
	26 Jun 2008	2.1, 4.2	Incorporated OMA-MCC-2008-0052
	16 Dec 2009	2, 3, 4.2, 6.3	Incorporated OMA-MCC-2008-0111R01
Candidate Version OMA-AD_Charging-V1_1	13 Feb 2009	n/a	Status changed by TP OMA-TP-2009-0062-INP_Charging_V1_1_ERP_for_Candidate_Approval
Draft Version OMA-AD_Charging-V1_1	16 Jun 2009	3.2, 3.3 4.2 6.3	Implemented agreed changes: OMA-MCC-2009-0027R01-CR_AoC_addition_in_AD_in_Charging_1.1 OMA-MCC-2009-0031R01-CR_AoC_Feature_Addtion_to_AD1.1 OMA-ARC-MCC-2009-0039-CR_Editorial_Change_to_Charging_AD
Candidate Version OMA-AD_Charging-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