Charging Architecture

Candidate Version 1.0 – 26 Sep 2006

Open Mobile Alliance

OMA-AD-Charging-V1_0-20060926-C

Contents

Figures

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].

[1] © 2004 Wi-Fi Alliance. All rights reserved. Wi-Fi® is a registered trademark of the Wi-Fi Alliance. Wi-Fi CERTIFIED(tm), WMM(tm), WPA(tm), WPA2(tm) and Wi-Fi ZONE(tm) are certification marks of the Wi-Fi Alliance.

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-Service-Environment-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

2.2 Informative References

[ARCH-PRINC] "OMA Architecture Principles", Open Mobile Alliance™, OMA-ArchitecturePrinciples-V1_2, URL: http://www.openmobilealliance.org/

[ARCH-REVIEW] "OMA Architecture Review Process", Open Mobile Alliance™, OMA-ARCHReviewProcess-V1_1, URL: http://www.openmobilealliance.org/

[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

Account Management	Maintaining accounts, where an account is a record of debit and credit transactions. See also *Charging Account.*
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 associted 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

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

[2] © 2004 Wi-Fi Alliance. All rights reserved. Wi-Fi® is a registered trademark of the Wi-Fi Alliance. Wi-Fi CERTIFIED(tm), WMM(tm), WPA(tm), WPA2(tm) and Wi-Fi ZONE(tm) are certification marks of the Wi-Fi Alliance.

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 Target Audience

The target audience for this document includes but is not limited to the following:

- Working Groups within OMA which include the possibility of charging for an event within the context of that working group's work (and thus need to generate Charging Events)
- Working Groups that need to understand the architecture of this subject matter
- Architecture Working Group (e.g. during Architecture Reviews as defined in [ARCH-REVIEW], to determine compliance of [ARCH-PRINC], etc.)
- Interoperability Working Group (e.g. for early analysis of interoperability requirements)
- Application Developers.

4.2 Use Cases

The use cases for the Charging Enabler are discussed in the Charging RD, [CHRG_RD].

4.3 Requirements

The requirements for the Charging Enabler are provided in the Charging RD, [CHRG_RD].

4.4 Planned Releases

This architecture reflects release 1.0 of the OMA Charging Enabler. There are no planned updates for this architecture.

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

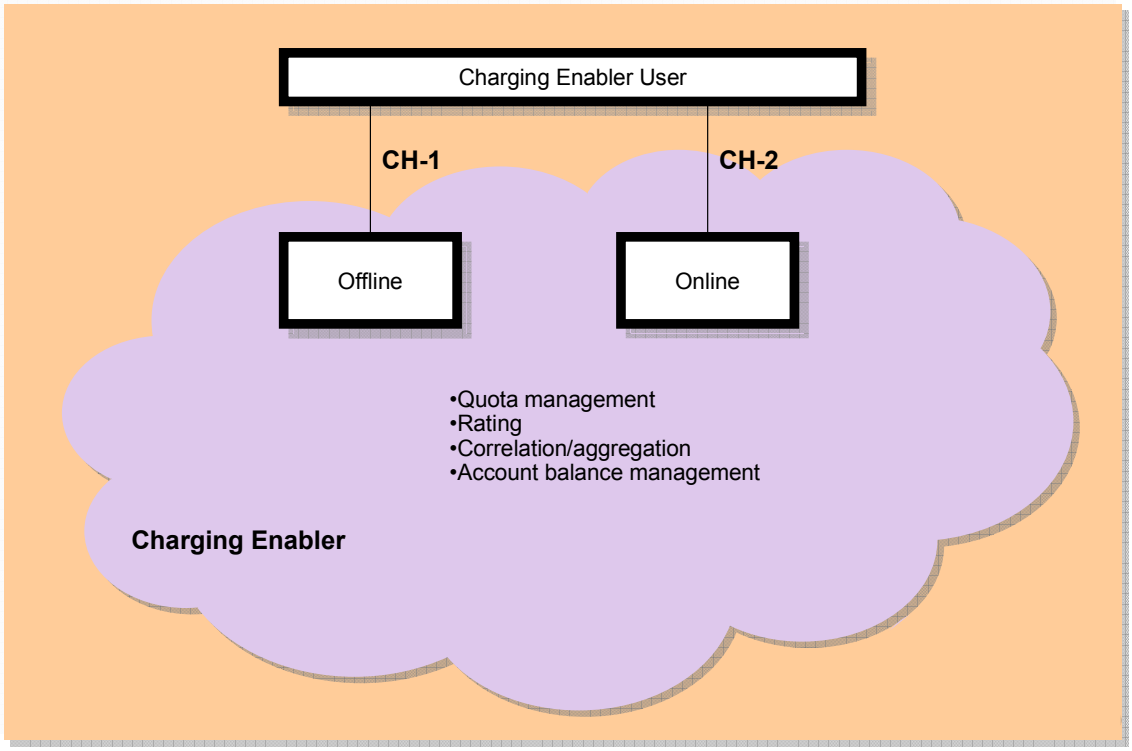

Figure 1: Charging Enabler Functional Architecure

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. Service is delivered.
5. When the service is terminated, or quota is depleted, the usage quota is reported back to the Charging Enabler.
6. 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 1.0 History

Document Identifier	Date	Sections	Description
Draft Versions OMA-AD_Charging-V1_0	12 Oct 2004	All	Initial draft
	16 Nov 2004	All	Review of envisioned content (per chapter)
	21 Feb 2005	All	Change to new AD template (as of 21 Jan 2005) Incorporate changes as agreed during TP#13, Frankfurt (cf. meeting minutes in OMA-MCC-2005-0039R02): See editor's notes for more information how exactly the contents of the agreed documents have been incorporated.
	15 Mar 2005	All	Accepted all changes from the 21 Feb 2005 issue. Incorporated changes agreed during the Berlin interim (9-11 March 2005). Decisions of meeting are captured in OMA-MCC-2005-0067R01. Namely, the changes proposed in following agreed documents were incorporated: OMA-MCC-2005-{0059, 0060, 0062R01, 0063, 0064R01, 0066, 0069R01, 0072R03}. Some alignments proposed by the editor and agreed in meeting are also captured in OMA-MCC-2005-0071.
	22 Mar 2005	All	Editorial updates: Removed duplicate information, aligned terminology, added references, definitions and abbreviations. Terminology is now as follows: Charging agent is not capitalized Charging event is not capitalized Chargeable event is in most occurrences the wrong term and has been replaced by charging event Charging event is not abbreviated Charging Enabler is capitalized because it is a name. The OMA prefix has been avoided (but not in all occurrences) The OSE entities relevant are: application (lowercase), enabler implementation (lowercase), Policy Enforcer (capitalized) Charging infrastructure mostly replaces charging system or charging capability Uppercase has only been used for concrete entities. Classes of entities, such as application or enabler implementation, are in lowercase.
	29 Mar 2005	All	Agreed contributions from following conference calls have been incorporated: CC from 17/03/05 (Minutes: OMA-MCC-2005-0083), CC from 24/03/05 (Minutes: OMA-MCC-2005-0089) Some documents have been agreed only with comments and updates to them are still anticipated. The following documents have been incorporated: CC on 17/03/05 OMA-MCC-2005-0076 OMA-MCC-2005-0078 OMA-MCC-2005-0079 OMA-MCC-2005-0080 OMA-MCC-2005-0081 CC on 24/03/05 OMA-MCC-2005-0077R01 OMA-MCC-2005-0085R01 OMA-MCC-2005-0086 OMA-MCC-2005-0087

Document Identifier	Date	Sections	Description
Draft Versions OMA-AD_Charging-V1_0	04 Apr 2005	3.2, 5.3, 6.5	Agreed contributions from conference call on 31 Mar 2005 incorporated: OMA-MCC-2005-0073R01 OMA-MCC-2005-0077R02 Editorial changes: Figures set in position frames, captions checked, internal cross-references introduced, diagram in 6.2.2 corrected.
	21 Apr 2005	All	Contributions agreed during Singapore meeting have been incorporated: OMA-MCC-2005-0080R01 OMA-MCC-2005-0090R02 OMA-MCC-2005-0094R01 OMA-MCC-2005-0097R01 OMA-MCC-2005-0098R01 OMA-MCC-2005-0099R01 OMA-MCC-2005-0100R03 OMA-MCC-2005-0102 OMA-MCC-2005-0104 OMA-MCC-2005-0106R01 OMA-MCC-2005-0107 (First change done, second change obsoleted by doc #98R01, which removes the text to be changed altogether) OMA-MCC-2005-0108R01 OMA-MCC-2005-0112 OMA-MCC-2005-0111 Chapter 6.6 (Chained Charging Client Scenario) has been removed (decision to do so has been taken in Singapore and is captured in the minutes, OMA-MCC-2005-0116R01).
	03 May 2005	All	References to the term “proxy” have been removed (as requested in OMA-MCC-2005-0109R01). Editorial changes: Flows have been redrawn for consistent look. Naming of messages has been aligned (Service Request – Service Interaction – *Service Termination*, *Interim* Quota Report – *Final* Quota Report) Text for subsection 6.2.3 (CH-3 reference point) has been corrected; in previous issue the wrong text had been cut&pasted from document OMA-MCC-2005-0106R01. Contributions from conference call on 28 April 2005 (minutes: OMA-MCC-2005-0125) incorporated: OMA-MCC-2005-0122
Draft Versions OMA-AD-Charging-V1_0	19 May 2005	All	Restructuring of the document, partly following proposals in document OMA-MCC-2005-0123R01, partly according to decisions from May 12th conference call (OMA-MCC-2005-0130).
	14 Jun 2005	All	Document restructured to be shorter based on feedback from the informal ARCH review. No material has been lost but rather moved to other documents. This version incorporates changes based on the following agreed documents: OMA-MCC-2005-146 OMA-MCC-2005-141 OMA-MCC-2005-134

Document Identifier	Date	Sections	Description
Draft Versions OMA-AD-Charging-V1_0	05 Aug 2005	All	Modifications according to the following agreed contributions: OMA-MCC-2005-0160R01 OMA-MCC-2005-0161 (superseded by 173R02 and 177) OMA-MCC-2005-063R02 (superseded by 173R02 and 177) OMA-MCC-2005-0164 OMA-MCC-2005-0167R02 OMA-MCC-2005-0173R02 OMA-MCC-2005-0177 OMA-MCC-2005-0182R01 OMA-MCC-2005-0183R01 Rating definition according to meeting minutes from 4 August 2005 (OMA-MCC-2005-0185)
	23 Aug 2005	All	Modifications according to the following agreed contributions: OMA-MCC-2005-0184R01 OMA-MCC-2005-0186R01 OMA-MCC-2005-0188R01 OMA-MCC-2005-0190R01 OMA-MCC-2005-0195R01
	09 Sep 2005	2.2	An editorial fix to informative references according to OMA-MCC-2005-0210.
	11 Oct 2005	All	Wording changes according to OMA-MCC-2005-0209R02. Wording changes based on comments received during the formal AD review (see OMA-ARC-2005-0320) and as agreed in OMA-MCC-2005-0224 (meeting minutes 20051006).
	09 Mar 2006	3, 5, and 6	Interface CH-3 removed as proposed in OMA-MCC-2006-0055R01.
	05 May 2006	1, 5.2, 6.2	Clerical fixes according to OMA-MCC-2006-0126R01.
	25 Aug 2006	2.2, 4.4	Unused references deleted. Document updated in line with review comment AD-001 (see OMA-CONRR-Charging-V1_0-20060608-D). Editorial change to definitions and defined terms in document (capitalized to align with the other Charging specifications).
Candidate Version OMA-AD-Charging-V1_0	26 Sep 2006	n/a	Status changed to Candidate by TP: TP ref. # OMA-TP-2006-0305-INP_Charging_V1_0_ERP_for_Candidate_Approval