



Location Architecture Overview Requirements

Historic Version 1.0 – 18 Nov 2004

Open Mobile Alliance

OMA-RD-LOC_ArchOverview-V1_0-20041118-H

Use of this document is subject to all of the terms and conditions of the Use Agreement located at <http://www.openmobilealliance.org/UseAgreement.html>.

Unless this document is clearly designated as an approved specification, this document is a work in process, is not an approved Open Mobile Alliance™ specification, and is subject to revision or removal without notice.

You may use this document or any part of the document for internal or educational purposes only, provided you do not modify, edit or take out of context the information in this document in any manner. Information contained in this document may be used, at your sole risk, for any purposes. You may not use this document in any other manner without the prior written permission of the Open Mobile Alliance. The Open Mobile Alliance authorizes you to copy this document, provided that you retain all copyright and other proprietary notices contained in the original materials on any copies of the materials and that you comply strictly with these terms. This copyright permission does not constitute an endorsement of the products or services. The Open Mobile Alliance assumes no responsibility for errors or omissions in this document.

Each Open Mobile Alliance member has agreed to use reasonable endeavors to inform the Open Mobile Alliance in a timely manner of Essential IPR as it becomes aware that the Essential IPR is related to the prepared or published specification. However, the members do not have an obligation to conduct IPR searches. The declared Essential IPR is publicly available to members and non-members of the Open Mobile Alliance and may be found on the “OMA IPR Declarations” list at <http://www.openmobilealliance.org/ipr.html>. The Open Mobile Alliance has not conducted an independent IPR review of this document and the information contained herein, and makes no representations or warranties regarding third party IPR, including without limitation patents, copyrights or trade secret rights. This document may contain inventions for which you must obtain licenses from third parties before making, using or selling the inventions. Defined terms above are set forth in the schedule to the Open Mobile Alliance Application Form.

NO REPRESENTATIONS OR WARRANTIES (WHETHER EXPRESS OR IMPLIED) ARE MADE BY THE OPEN MOBILE ALLIANCE OR ANY OPEN MOBILE ALLIANCE MEMBER OR ITS AFFILIATES REGARDING ANY OF THE IPR'S REPRESENTED ON THE “OMA IPR DECLARATIONS” LIST, INCLUDING, BUT NOT LIMITED TO THE ACCURACY, COMPLETENESS, VALIDITY OR RELEVANCE OF THE INFORMATION OR WHETHER OR NOT SUCH RIGHTS ARE ESSENTIAL OR NON-ESSENTIAL.

THE OPEN MOBILE ALLIANCE IS NOT LIABLE FOR AND HEREBY DISCLAIMS ANY DIRECT, INDIRECT, PUNITIVE, SPECIAL, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES ARISING OUT OF OR IN CONNECTION WITH THE USE OF DOCUMENTS AND THE INFORMATION CONTAINED IN THE DOCUMENTS.

© 2004 Open Mobile Alliance Ltd. All Rights Reserved.

Used with the permission of the Open Mobile Alliance Ltd. under the terms set forth above.

Contents

1. SCOPE (INFORMATIVE)	7
2. REFERENCES	8
2.1 NORMATIVE REFERENCES	8
2.2 INFORMATIVE REFERENCES	8
3. TERMINOLOGY AND CONVENTIONS	9
3.1 CONVENTIONS	9
3.2 DEFINITIONS	9
3.3 ABBREVIATIONS	11
4. INTRODUCTION (INFORMATIVE)	12
5. USE CASES (INFORMATIVE)	13
5.1 USE CASE I&E, DISCOVERY OF MOBILE LOCATION SERVICES	13
5.1.1 Short Description	13
5.1.2 Actors	13
5.1.3 Pre-conditions	14
5.1.4 Post-conditions	14
5.1.5 Normal Flow	14
5.1.6 Alternative Flow	14
5.1.7 Operational and Quality of Experience Requirements	14
5.2 USE CASE I&E, DOWNLOAD MLS APPLICATIONS & CONTENT	15
5.2.1 Short Description	15
5.2.2 Actors	15
5.2.3 Pre-conditions	15
5.2.4 Post-conditions	15
5.2.5 Normal Flow	15
5.2.6 Alternative Flow	16
5.2.7 Operational and Quality of Experience Requirements	16
5.3 USE CASE I&E, ACCESS TO PRIVACY AND USER PREFERENCES	17
5.3.1 Short Description	17
5.3.2 Actors	17
5.3.3 Pre-conditions	17
5.3.4 Post-conditions	17
5.3.5 Normal Flow	17
5.3.6 Alternative Flow	18
5.3.7 Operational and Quality of Experience Requirements	18
5.4 USE CASE I&E, CURRENT POSITION (WHERE AM I?)	19
5.4.1 Short Description	19
5.4.2 Actors	19
5.4.3 Pre-conditions	19
5.4.4 Post-conditions	19
5.4.5 Normal Flow	19
5.4.6 Alternative Flow	19
5.4.7 Operational and Quality of Experience Requirements	20
5.5 USE CASE I&E, SAVING LOCATION INFORMATION TO A TERMINAL	21
5.5.1 Short Description	21
5.5.2 Actors	21
5.5.3 Pre-conditions	21
5.5.4 Post-conditions	21
5.5.5 Normal Flow	22
5.5.6 Alternative Flow	22
5.5.7 Operational and Quality of Experience Requirements	22
5.6 USE CASE I&E, LOCATION INFORMATION DELIVERY	23
5.6.1 Short Description	23

- 5.6.2 Actors..... 23
- 5.6.3 Pre-conditions 23
- 5.6.4 Post-conditions..... 23
- 5.6.5 Normal Flow 23
- 5.6.6 Alternative Flow 24
- 5.6.7 Operational and Quality of Experience Requirements..... 24
- 5.7 USE CASE I&E, USING POI DETAILED INFORMATION 25**
- 5.7.1 Short Description 25
- 5.7.2 Actors..... 25
- 5.7.3 Pre-conditions 25
- 5.7.4 Post-conditions..... 25
- 5.7.5 Normal Flow 25
- 5.7.6 Alternative Flow 26
- 5.7.7 Operational and Quality of Experience Requirements..... 26
- 5.8 USE CASE I&E, PERIODIC TRACKING OF LOCATION..... 27**
- 5.8.1 Short Description 27
- 5.8.2 Actors..... 27
- 5.8.3 Pre-conditions 27
- 5.8.4 Post-conditions..... 27
- 5.8.5 Normal Flow 27
- 5.8.6 Alternative Flow 28
- 5.8.7 Operational and Quality of Experience Requirements..... 28
- 5.9 USE CASE OTHER, EMERGENCY SERVICES 29**
- 5.9.1 Short Description 29
- 5.9.2 Actors..... 29
- 5.9.3 Pre-conditions 29
- 5.9.4 Post-conditions..... 29
- 5.9.5 Normal Flow 29
- 5.9.6 Alternative Flow 30
- 5.9.7 Operational and Quality of Experience Requirements..... 30
- 5.10 USE CASE I&E, FRIEND FINDER 31**
- 5.10.1 Short Description 31
- 5.10.2 Actors..... 31
- 5.10.3 Pre-conditions 31
- 5.10.4 Post-conditions..... 31
- 5.10.5 Normal Flow 31
- 5.10.6 Alternative Flow 31
- 5.10.7 Operational and Quality of Experience Requirements..... 32
- 5.11 USE CASE I&E, LOCATION-ENABLING CLIENT APPLICATIONS..... 33**
- 5.11.1 Short Description 33
- 5.11.2 Actors..... 33
- 5.11.3 Pre-conditions 33
- 5.11.4 Post-conditions..... 33
- 5.11.5 Normal Flow 33
- 5.11.6 Alternative Flow 33
- 5.11.7 Operational and Quality of Experience Requirements..... 34
- 5.12 USE CASE I&E, LOCATION ALERT 35**
- 5.12.1 Short Description 35
- 5.12.2 Actors..... 35
- 5.12.3 Pre-conditions 35
- 5.12.4 Post-conditions..... 35
- 5.12.5 Normal Flow 35
- 5.12.6 Alternative Flow 35
- 5.12.7 Operational and Quality of Experience Requirements..... 36
- 5.13 USE CASE I&E, NAVIGATION SERVICE..... 37**
- 5.13.1 Short Description 37
- 5.13.2 Actors..... 37

- 5.13.3 Pre-conditions 37
- 5.13.4 Post-conditions..... 37
- 5.13.5 Normal Flow 37
- 5.13.6 Alternative Flow 38
- 5.13.7 Operational and Quality of Experience Requirements..... 38
- 5.14 USE CASE OTHER, USER-FRIENDLY OUTPUT 39**
 - 5.14.1 Short Description 39
 - 5.14.2 Actors..... 39
 - 5.14.3 Pre-conditions 39
 - 5.14.4 Post-conditions..... 39
 - 5.14.5 Normal Flow 39
 - 5.14.6 Alternative Flows..... 40
 - 5.14.7 Operational and Quality of Experience Requirements..... 40
- 5.15 USE CASE I&E, REPORT OF PSEUDO-LOCATION BASED ON USER PROFILE..... 41**
 - 5.15.1 Short Description 41
 - 5.15.2 Actors..... 41
 - 5.15.3 Pre-conditions 41
 - 5.15.4 Post-conditions..... 41
 - 5.15.5 Normal Flow 42
 - 5.15.6 Alternative Flow 42
 - 5.15.7 Operational and Quality of Experience Requirements..... 42
- 5.16 OPEN ISSUES..... 43**
- 6. REQUIREMENTS (NORMATIVE)..... 44**
 - 6.1 HIGH-LEVEL FUNCTIONAL REQUIREMENTS 44**
 - 6.1.1 General..... 44
 - 6.1.2 End-user..... 45
 - 6.1.3 Terminal..... 47
 - 6.1.4 Privacy & Security..... 47
 - 6.1.5 Location Information 48
- APPENDIX A. CHANGE HISTORY (INFORMATIVE)..... 49**
 - A.1 APPROVED VERSION HISTORY 49**
 - A.2 DRAFT/CANDIDATE VERSION 1.0 HISTORY 49**

Tables

- Table 1: Affected Areas for Discovery of Mobile Location Services 13**
- Table 2: Affected Areas for Download MLS applications & content..... 15**
- Table 3: Affected Areas for Access to privacy and user preferences 17**
- Table 4: Affected Areas for Current position (where am I?)..... 19**
- Table 5: Affected Areas for Saving Location Information to a Terminal..... 21**
- Table 6: Affected Areas for Location Information Delivery..... 23**
- Table 7: Affected Areas for Using POI Detailed Information 25**
- Table 8: Affected Areas for Periodic Tracking of Location..... 27**
- Table 9: Affected Areas for Emergency Services..... 29**
- Table 10: Affected Areas for Friend Finder 31**
- Table 11: Affected Areas for Location-enabling client applications 33**
- Table 12: Affected Areas for Location Alert 35**

Table 13: Affected Areas for Navigation Service.....37

Table 14: Affected Areas for User-friendly output.....39

Table 15: Affected Areas for Report of Pseudo-Location based on User Profile.....41

1. Scope

(Informative)

This document identifies use cases and requirements for OMA Mobile Location Services (MLS) as described in WID OMA-TP-2003-0201-LOC_WID_Arch_Overview.

The objective of the OMA Location Architecture Overview work item is to provide an end to end overview of the location architecture, including functionality to be developed in the future by the Location WG. The architecture is expected to identify missing functions, interfaces, etc that are necessary to support future OMA location enablers. Thus, the scope of the OMA Mobile Location Services overview architecture spans across all the location-related architectures that are specified in OMA, i.e., subsequent architectures defined in OMA exist within the scope defined by the overall MLS architecture.

This Requirements Document (RD) containing use cases and normative enumerated requirements establishes high level requirements for the OMA Mobile Location Services architecture.

2. References

2.1 Normative References

- [RFC2119] "Key words for use in RFCs to Indicate Requirement Levels", S. Bradner, March 1997, [URL:http://www.ietf.org/rfc/rfc2119.txt](http://www.ietf.org/rfc/rfc2119.txt)
- [OMA_Priv] Privacy Requirements for Mobile Services, Open Mobile Alliance™, OMA-RD_Privacy-V1_0_0-20031104-A, URL: <http://www.openmobilealliance.org/>.

2.2 Informative References

- [ArchOverWID] Open Mobile Alliance™ Location Architecture Overview WI: OMA-TP-2003-0201-LOC_WID_Arch_Overview <http://www.openmobilealliance.org>
- [3GPP_22.071] 3GPP TS 22.071: "Location Services (LCS); Service description, Stage 1".
- [3GPP_23.271] 3GPP TS 23.271: "Functional stage 2 description of LCS"
- [OMA_MLP] "Mobile Location Protocol". Open Mobile Alliance™. LIF-TS-101-V3.0.0. <http://www.openmobilealliance.org>
- [WAP_Arch] "WAP Architecture". Open Mobile Alliance™. WAP-210-WAPArch. <http://www.openmobilealliance.org>
- [WAP_FW] "WAP Location Framework Overview". WAP Forum™. WAP-256-LOCFW-20010912-d. [URL:http://www.wapforum.org/](http://www.wapforum.org/)
- [WAP_LOCProt] "WAP Location Protocols Specification", WAP Forum™. WAP-257-LOCProt-20010912-d. URL: <http://www.wapforum.org/>
- [WAP_LOCSpec] "WAP Location Protocols Specification", WAP Forum™. WAP-258-LOCFORM-20010912-d. URL: <http://www.wapforum.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.

This is an informative document, which is not intended to provide testable requirements to implementations.

3.2 Definitions

Application	An application, in the context of the Location Enabler, is the final destination and using entity of location information. An application may be executed on a Mobile terminal platform or on an application server platform.
Application Server	An application server, in the context of the Location Enabler, is a serving entity typically in IP based network, executing an application, capable of utilizing provided location information.
A-GPS	Assisted Global Positioning System. GPS variant where some portion of the data is delivered from or to the GPS receiver with means other than directly from satellites, in order to improve the performance of positioning. A-GPS may be deployed in terminal based and/or terminal assisted mode, referring to the residence of position calculation function and algorithm.
Direction	Describes the point of compass of a movement. Direction may be independent of an orientation of the target device.
Device ID	In this context the device id is considered to include the same parameters as the target id. It is considered to mean IMSI, IMEI, MSISDN, or any unique identification of a mobile device.
End-User	End-user is a person that interacts with the terminal hosting an application to view, hear or otherwise use rendered content
E-OTD	Enhanced Observed Time Difference. 3GPP standard for a positioning mechanism, based on measurements of GSM signaling. May be deployed in terminal based and/or terminal assisted mode, referring to the residence where the position calculation function and algorithm is deployed.
GPS	Global Positioning System. A satellite-based positioning system, consisting of Space, Control, and User Segments, targeted to locate mobile or stationary equipment. A GPS receiver is a piece of equipment, capable of receiving and processing all or some of the necessary information from GPS satellites, in order to provide the receiver’s current position.
Heading	Describes a bearing of a target device (e.g. Northing, Easting). Heading may be independent of direction of a possible movement.
Location	Reference to a position. Location may be calculated using some positioning mechanism or be presented as a stated location. It may be expressed in terms of geographical location in some format (e.g. latitude+longitude+altitude) of location or as physical location (e.g. home). If location is expressed in geographical terms and describes current location, it equals to position(ing) information.
Location Delivery	Operation over an interface between two entities, having Location Descriptor and possibly other information encoded within a protocol payload or a primitive. Location Delivery is independent of transport protocol methods (request/response), and does not require a Location

	Invocation to proceed between the connecting entities.
Location Descriptor	A data value, expressing target's location or position information in selected format of location, time when the location was acquired and shape if applicable. May also include information related to a location of target, including both various location formats (different coordinate systems and datum), and other types of location information such as street names (geo-info) etc. It may also include some descriptive information related to the positioning, e.g., QoP values.
Location Destination	An entity that is addressed as an ultimate receiver of the location descriptor's delivery.
Location Format	Defines the coordinate reference system, datum and representation format and coding used for location information.
Location Invocation	Operation over an interface between two entities, having an indication of a need of a Location Descriptor and possibly other information encoded within a protocol payload. Location Invocation is independent of transport protocol methods (request/response).
Location Related Information	Information with a close relationship to geographical appearance or existence. Examples could be, but are not limited to, orientation, direction, velocity, and acceleration.
LBS Requestor	An entity that issues any service or application request, which at some point is followed by a Location Invocation.
Location Source	An entity that is capable of delivering the Location Descriptor for the Location Destination.
Mobile Terminal	A networked device that hosts the application typically used by a user to request and receive information. Enabled by a subscription of an access service, Mobile Terminal is able to access some remote resources.
Network Based Positioning	A positioning procedure and calculation performed entirely by the mobile network without needing any terminal support for procedure or for calculation.
Positioning	A procedure to determine the target mobile terminal's current position. The positioning includes procedures and functions in network nodes and/or in located mobile terminal.
Positioning Specific Data	Data used within the procedure to determine the target mobile terminal's current position. Data exchanged between terminal and network in E-OTD measurements, GPS assistance data, Cell ID, and timing advance are examples of Positioning Specific Data.
Position(ing) Information	Description of location as coordinates in a reference system. Expresses the calculated current state of geographical existence of the target device.
Location/Position Based Service	Service capable of utilizing location information of the mobile terminal(s) in execution process. A Location Based Service typically consists of an application, which adds value in some way to certain content with location/position. A Location Based Service may be available globally while the output of the service varies.
Location/Position Dependent Service	Service that is only available within a certain geographical place or area.
PSAP	Public Service Answering Point. An emergency services network element that is responsible for answering emergency calls in USA.
QoP	Quality of Position. By a list of attributes, describes the characteristics of the position in pre-defined units. Attributes could be, but are not limited to, accuracy, confidence/uncertainty, response time, time-to-first-fix, and priority
QoS	Quality of Service. By a list of attributes, describes the characteristics of the delivery service of a network in pre-defined units. Attributes could be, but are not limited to, data delivery rate, bit error rate.
Subscriber	A legal entity (may or may not be a person) that owns the subscription of the service in question. The user and the subscriber need not be the same - e.g. a company (the subscriber) may supply services to its employees (the users). The user uses a mobile terminal to access the

	service(s) in question.
Terminal Assisted Positioning	A positioning procedure in co-operation by the target terminal and a serving entity. A dedicated serving entity in network performs the position calculation.
Terminal Based Positioning	A positioning procedure in co-operation by the target terminal and a serving entity. The terminal performs the position calculation process and algorithm.
Terminal Based Standalone Positioning	A positioning procedure, performed entirely by the target terminal without needing any support for this procedure or calculation from a terrestrial serving entity.
Target ID	Identifier of the user associated with the device that is requested to be located. Identified e.g. as MSISDN, anonymous ID, or pseudonym.

3.3 Abbreviations

ANSI	American National Standards Institute
DTD	Document Type Definition
GMLC	Gateway Mobile Location Centre
GMT	Greenwich Mean Time
HTTP	HyperText Transfer Protocol
HTTPS	HTTP Secure
LCS	LoCation Services
LMU	Location Measurement Unit
MLC	Mobile Location Centre
MLP	Mobile Location Protocol
MLS	Mobile Location Services
MPC	Mobile Positioning Center
MS	Mobile Station
MSID	Mobile Station Identifier
MSISDN	Mobile Station Integrated Services Data Network
PDE	Position Determination Entity
POI	Point(s) of Interest
PSAP	Public Service Answering Point
SMLC	Serving Mobile Location Centre
SSL	Secure Socket Layer
TLS	Transport Layer Security
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
WAP	Wireless Application Protocol
XML	eXtensible Markup Language

4. Introduction

(Informative)

Currently, two main standards specifications exist within OMA for Mobile Location Services: Location Interoperability Forum's Mobile Location Protocol [OMA-MLP] and Location-based services from Wireless Application Protocol (WAP) [WAP_Arch], [WAP_FW], [WAP_LocProt], [WAP_LocSpec]. These specifications were developed with a specific goal in mind, to create a solution for acquiring location information of a target. In order to examine more broadly other usages and services that are necessary for providing end-to-end Mobile Location Services, it becomes necessary to articulate the Mobile Location Service capabilities that would be desired by end-users. These capabilities, described by end-user experiences (i.e., use cases) in a section in this document, are translated into normative requirements in a subsequent section in the document. An architecture overview document that fulfils the normative requirements will follow in a succeeding document.

5. Use Cases (Informative)

This section identifies capabilities, in terms of end user experiences, provided by the next generation OMA Location architecture. The section is intended to be an informative description of typical end-user usages of Mobile Location Services. The purpose is to identify the capabilities desired so that the subsequent normative requirements section and associated architecture specifications can be created in order to accomplish the desired capabilities. The user experiences described herein are intended to uniquely capture the desired capabilities of the OMA Location architecture. The true essence of the use cases should be clear to the reader, i.e., the text surrounding the capability in each use case serves only to illustrate a real-world scenario that may be enabled by the capability.

It is impractical to list all usages for Mobile Location Services, as this is limitless. Hence, the use cases that follow are **not** meant to be an exhaustive list. However, each use case in this document uniquely identifies a specific desired capability that needs to be provided by the OMA Location architecture.

5.1 Use Case I&E, Discovery of Mobile Location Services

	Affected Areas				
	Device	Connectivity	Enabling Services	Applications	Content
Tickmarks (X)	X		X	X	X
Additional Keywords					

Table 1: Affected Areas for Discovery of Mobile Location Services

5.1.1 Short Description

Capability: Discovery of Mobile Location Services. This use case describes the capability for a user or application to discover the Mobile Location Services that are available.

A user has access to applications that take advantage of dynamically discovered location services based on the application needs, user preferences, location of the user, or other criteria. In some cases those services may be presented by the application to the user, in other cases the discovery of those services may be hidden from the user.

A key concept is dynamic discovery. Based on a user's location, new or different services may be available. Applications should be able to discover those services.

5.1.2 Actors

- User who wants to dynamically take advantage of location services which are currently available.
- Mobile device determining and providing local and network-based available MLS
- Network Operator / Service Provider providing available MLS in the network
- Application querying for available location services.
- Service Registry on the web (e.g., UDDI).

5.1.2.1 Actor Specific Issues

- Network Operator / Service Provider may make visible only the services for which the user is authorized to access.

5.1.2.2 Actor Specific Benefits

- The discovery capability benefits the user and applications actors since it allows for extended MLS functionality by providing information on the available MLS services.

5.1.3 Pre-conditions

- Network connectivity for determining available MLS in the network
- Applications offering MLS on the network are provisioned on the device and registered in the service registry.

5.1.4 Post-conditions

- List of selectable MLS services available.

5.1.5 Normal Flow

1. User selects application on mobile device that requires knowledge of locally available MLS.
2. Application uses Mobile device location to determine locally available MLS, along with any other necessary criteria.
3. Application connects with MLS web services discovered through a provisioned MLS registry
4. Application interacts with device or network-provided location service to determine location and with newly discovered web services to perform functions requested by the end user.

5.1.6 Alternative Flow

- User may alternatively 'browse' the MLS service registry directly to select from the available MLS-related services, including positioning services.

5.1.7 Operational and Quality of Experience Requirements

- MLS service registry to be consulted must be known / provisioned in advance. User must be authorized to use the services in the MLS registry.

5.2 Use Case I&E, Download MLS applications & content

	Affected Areas				
	Device	Connectivity	Enabling Services	Applications	Content
Tickmarks (X)	X		X	X	X
Additional Keywords					

Table 2: Affected Areas for Download MLS applications & content

5.2.1 Short Description

Capability: Downloading MLS applications and content (i.e., maps, etc.) to the user's device for later retrieval. This use case describes the capability for a user to download MLS applications and content from the network.

A user wishes to download an MLS application and associated content from the network. As the user surfs the Internet on his mobile device (phone, PDA, laptop, etc.) he encounters a site that allows him to purchase and download an MLS application and content to his mobile device. The user may decide to use the downloaded application and content later when he needs them, e.g., he is headed to a rural setting where network access is intermittent.

5.2.2 Actors

- User who wants to download MLS applications and content
- Mobile device capable of provisioning for downloaded applications and content
- Network Operator / Service Provider providing MLS applications and content storable on user mobile devices

5.2.2.1 Actor Specific Issues

- User must be authorized by the application / content provider
- Communication between mobile device and network must allow for proper download of application / content.

5.2.2.2 Actor Specific Benefits

- User obtains the desired application / content that also benefits the application / content providers with a source of revenue

5.2.3 Pre-conditions

- Network connectivity for downloading MLS applications and content to mobile device

5.2.4 Post-conditions

- Downloaded MLS application and/or content

5.2.5 Normal Flow

1. User selects function on his mobile device to download MLS application and/or content
2. Mobile device downloads MLS application and/or content
3. User runs MLS application and content locally on the mobile device, that may or may not require network connectivity

5.2.6 Alternative Flow

- MLS application and/or content can be pushed to the user's mobile device from the provider (e.g., when new content is available or periodically), as authorized and chosen by the user.

5.2.7 Operational and Quality of Experience Requirements

- Mobile device and trusted network provider must be capable of authenticating and authorizing the user to download the requested MLS application / content.
- Mobile device must be capable of utilizing the downloaded application / content.

5.3 Use Case I&E, Access to privacy and user preferences

	Affected Areas				
	Device	Connectivity	Enabling Services	Applications	Content
Tickmarks (X)	X		X	X	
Additional Keywords					

Table 3: Affected Areas for Access to privacy and user preferences

5.3.1 Short Description

Capability: Access to privacy and user preferences for use of MLS. This use case describes the capability for a user to view and update their privacy and user preferences.

A user wishes to view her privacy settings and user preferences when using MLS, so she uses her mobile device (phone, PDA, laptop, etc.) to display and edit her privacy and user preferences. She would like to ensure that anytime her location information is being requested, she is notified and approves the request.

For general privacy requirements, refer to OMA Privacy Requirements document [OMA_Priv]

5.3.2 Actors

- User who wants to view and edit her privacy and user preferences information.
- Mobile device capable of allowing privacy and user preferences information to be viewed and edited by the authorized user.
- Network Operator / Service Provider ensuring that user's selection of privacy and user settings are enforced by the network.

Note: This use case does not mandate that privacy be handled in the user's mobile device or in the network. It merely stipulates the need for users to access their privacy and preferences settings and edit them as necessary.

5.3.2.1 Actor Specific Issues

- All location-related interactions must obey the privacy policy established by the user. Additionally, the privacy policy of other actors, e.g., Network Operator / Service Operator may also be enforced per their respective business rules.

5.3.2.2 Actor Specific Benefits

- User is enabled to view and edit their privacy information pertaining to their location. Network Operator / Service Provider can apply the user-specified privacy policy to safeguard their subscribers from unauthorized requests for their location.

5.3.3 Pre-conditions

- Check is performed to verify user is the authorized user

5.3.4 Post-conditions

- Privacy / user preferences are (re)established

5.3.5 Normal Flow

For general privacy requirements, refer to OMA Privacy Requirements document [OMA_Priv]

1. User selects functionality to view and edit her privacy and user preference settings
2. Mobile device provides current settings and allows user to update settings as desired
3. Mobile device and network synchronize on privacy and user preference settings to ensure that user's selections are pervasive across mobile device and network.

5.3.6 Alternative Flow

- The user's privacy settings may alternatively be stored in a single entity, e.g., at the network operator. In this case, all location requests for the user's location would first need to be checked against that central database.

5.3.7 Operational and Quality of Experience Requirements

- The ability for a user to view / edit his/her privacy settings should be made user-friendly so that the user can confidentially use MLS services knowing that their specified privacy policy is in effect for all transactions that involve their location. For user's that are less concerned with their privacy, this capability gives them the flexibility to choose how freely and to whom they wish to reveal their location.

5.4 Use Case I&E, Current position (where am I?)

	Affected Areas				
	Device	Connectivity	Enabling Services	Applications	Content
Tickmarks (X)	X		X	X	
Additional Keywords					

Table 4: Affected Areas for Current position (where am I?)

5.4.1 Short Description

Capability: Provide current location of mobile device. This use case describes the basic capability for the user to request his current location, based on user preferences/criteria.

A user wants to know his current physical location as he travels through a city so he selects the appropriate function on his mobile device (phone, PDA, laptop, etc.) to provide his location.

5.4.2 Actors

- User (target) who wants to know his current physical location.
- Mobile device providing physical location (through interaction with the network or by itself)
- Network that may calculate and provide the user the current physical location of the mobile device

5.4.2.1 Actor Specific Issues

- Mobile device needs to convey location to the user actor via a user interface.

5.4.2.2 Actor Specific Benefits

- User obtains present geographic location. Mobile device utilizes one of many positioning methods that are either mobile-based or network-based. Network can aid or calculate location and provide it to the user, charging for services rendered as appropriate.

5.4.3 Pre-conditions

- Mobile device has the ability to either determine its own location or has the ability to communicate with the network to obtain its location.

5.4.4 Post-conditions

- Location of user's mobile device is returned

5.4.5 Normal Flow

1. User runs MLS application to acquire location of mobile device.
2. Mobile device provides location information (obtained either in the network or on the mobile itself)

5.4.6 Alternative Flow

- If the user does not have network connectivity he would rely solely on terminal-based positioning.

5.4.7 Operational and Quality of Experience Requirements

- Response time for acquiring the geographic location of a user is vital for successful adoption of Mobile Location Services (MLS). The user should be able to see a response (either location or progress status) within a short period of time of requesting his/her location.

5.5 Use Case I&E, Saving Location Information to a Terminal

	Affected Areas				
	Device	Connectivity	Enabling Services	Applications	Content
Tickmarks (X)	X		X	X	X
Additional Keywords					

Table 5: Affected Areas for Saving Location Information to a Terminal

5.5.1 Short Description

A user sets his mobile phone to save current location information, which will be used later as his location reference for Location Service Applications until he resets the phone back to normal. He searches for nearby restaurants and receives local weather alert service without retrieving his current location again.

5.5.2 Actors

Mobile Subscriber who wishes to save his/her location so that it can be recalled at a later time.

Mobile Device that is capable of storing its location for retrieval at a later time.

Location Service Applications that are capable of utilizing the stored location.

Location Source is the source of the location.

5.5.2.1 Actor Specific Issues

Mobile Subscriber enables/disables Location saving mode on his mobile terminal.

When enabled, current location information is saved in user's mobile terminal.

5.5.2.2 Actor Specific Benefits

The mobile device does not need to be connected again to a wireless network, which saves the mobile subscriber time and cost.

The network traffic used for acquiring location information is reduced by re-using location information saved in a mobile device.

User can control his/her location exposure.

5.5.3 Pre-conditions

Mobile device retrieves user's location information regardless of position detection methods.

Location service application requires user's current location information.

Location information is not usually saved unless user enables the location saving mode.

When enabled, the location information is saved in the device for later use until user disables it.

All location applications (downloadable or embedded) in the mobile device can share user's location information.

5.5.4 Post-conditions

After location mode is changed, location server sends a confirm message to the user.

5.5.5 Normal Flow

User starts a Location information retrieving application.

User sets the mobile device to 'save' mode.

1. The mobile device notifies location server that it enters into the 'save' mode.
2. The Location server send a confirm message.
3. The mobile device's location information is not retrieved from the location server until the user resets the Location information mode to 'active'.

5.5.6 Alternative Flow

- User can pre-specify the duration and frequency of the location saving mode.

5.5.7 Operational and Quality of Experience Requirements

- The location information is saved and shared in all applications on the mobile device.

5.6 Use Case I&E, Location Information Delivery

	Affected Areas				
	Device	Connectivity	Enabling Services	Applications	Content
Tickmarks (X)	X		X	X	X
Additional Keywords					

Table 6: Affected Areas for Location Information Delivery

5.6.1 Short Description

User gets lost on the way to the meeting place. He picks up his mobile phone and calls another user, but he can't tell where exactly he is. The user uses an 'I-am-here-application' and sends his location to the other user. The recipient's mobile phone receives the location information message, and now he can see the sender's location displayed on a map.

5.6.2 Actors

Mobile User(s) are the end-users of this capability

Mobile Device A (Sender) – one who wishes to send his/her location to another user

Mobile Device B (Receiver) – one who receives location of a Sender

Location Source – source of the location information

Application – application that utilizes the location that is transferred from Sender to Receiver

5.6.2.1 Actor Specific Issues

Mobile Device A sends location information to Mobile Device B by peer-to-peer location delivery service.

The positioning method depends on service providers' provision.

5.6.2.2 Actor Specific Benefits

Mobile user delivers location information to other users without involving location servers.

Workload of the location server is reduced.

Time delay of device-to-server communication is not required.

5.6.3 Pre-conditions

Location information delivery is performed without disturbing voice call. User can send/receive location information while he/she is talking on the phone.

User can distribute his location information to multiple devices.

5.6.4 Post-conditions

The received location information is displayed as a text message or marked on a map.

5.6.5 Normal Flow

1. User A starts a Location Delivery application on his mobile device.
2. User A specifies recipients and presses the 'Send' button.

3. The application of the user A sends the location information to the specified recipients.
4. The receiver gets the location information message and displays it.

5.6.6 Alternative Flow

None

5.6.7 Operational and Quality of Experience Requirements

To increase the network environment efficiency, Data Burst Messaging can be used for the location information delivery.

5.7 Use Case I&E, Using POI Detailed Information

	Affected Areas				
	Device	Connectivity	Enabling Services	Applications	Content
Tickmarks (X)	X		X	X	X
Additional Keywords					

Table 7: Affected Areas for Using POI Detailed Information

5.7.1 Short Description

User searches for POIs using Location Services. As a result the user can choose a POI(s) which has detail information associated with it and call directly or access to its web site on the mobile device.

5.7.2 Actors

Mobile Subscriber(s) that utilize the POI information using value-added applications

Mobile Device – device that acquires POI information and combines it with location to provide useful services to the end-users.

Location Source – source of location information

POI contents Server – storage for POI information

5.7.2.1 Actor Specific Issues

Mobile subscriber receives POI search result which includes the attributes of POI.

User can select a POI item and see its associated information.

5.7.2.2 Actor Specific Benefits

User can receive all the necessary information associated with the POI, so he does not have to do additional queries for details such as a phone number, an address or a URL.

5.7.3 Pre-conditions

The POI data should include detailed information such as name, address, phone number, URL, etc.

5.7.4 Post-conditions

The selected information should open an appropriate viewer (map viewer, phone dialer, internet browser, etc.).

The user can go back to the POI detail information page.

5.7.5 Normal Flow

User searches for a specific POI.

The user selects one POI item from the search result.

The mobile device displays a list of POI data details.

The user selects an item from the list such as phone number or URL, and gets information accordingly.

5.7.6 Alternative Flow

The mobile device may intelligently provide unsolicited POI information to the user based on certain conditions, e.g., time of day or present location.

5.7.7 Operational and Quality of Experience Requirements

The POI information should be associated with its attributes.

5.8 Use Case I&E, Periodic Tracking of Location

	Affected Areas				
	Device	Connectivity	Enabling Services	Applications	Content
Tickmarks (X)	X		X	X	
Additional Keywords					

Table 8: Affected Areas for Periodic Tracking of Location

5.8.1 Short Description

Capability: Track location for a specified time. This use case describes the basic capability for the user to request tracking of his location for a specified time.

A user wants to track his walking pattern so he runs an application on his mobile device (phone, PDA, laptop, etc.) to provide him periodic reports from 8am – 9am.

Periodicity can be temporal or spatial, e.g., based on time or distance.

Note: This use case is not intended to address querying of historical tracking information.

5.8.2 Actors

- User who wants to track his physical location during a specified time period.
- Mobile device providing the user's physical location (reported periodically)
- Network Operator sends periodic location reports to the mobile device.

5.8.2.1 Actor Specific Issues

- Since this is user-initiated, presumably the user has already agreed for his/her location to be transmitted to another user.

5.8.2.2 Actor Specific Benefits

- User is tracked per his request from his mobile device. Network operator provides the value-added service to track user's location.

5.8.3 Pre-conditions

- Approval from user to track his location for a specified period of time.

5.8.4 Post-conditions

- Location of user is tracked for a specified time

5.8.5 Normal Flow

1. User runs MLS application to acquire location of his mobile device and send him location updates periodically for a specified time.
2. Mobile device gets location information with periodic reports on a periodic basis from the network.
3. Mobile device provides the tracked location.

5.8.6 Alternative Flow

- The mobile device may itself determine and track the user, and thus provide periodic location reports.

5.8.7 Operational and Quality of Experience Requirements

- As with other use cases, the timeliness of acquiring and reporting location fixes within the time period is important for proper end-user experience, i.e., user response time is important.

5.9 Use Case Other, Emergency Services

	Affected Areas				
	Device	Connectivity	Enabling Services	Applications	Content
Tickmarks (X)	X		X	X	
Additional Keywords					

Table 9: Affected Areas for Emergency Services

5.9.1 Short Description

Capability: Emergency services. This use case describes the basic capability for an emergency service to acquire the location of a mobile device. Emergency services get the location of people suffering from emergencies such as fire, car accident and bad weather, so that a fireman can find and help them easier.

A user initiates an emergency service that causes the query for the location of the user's mobile device. Also, authorized emergency centers may initiate an emergency service by requesting the location(s) of available mobile device(s) located within a defined emergency area. And then, their locations or corresponding location parameters are automatically transferred to the emergency center so that a fireman can find and help them easier.

5.9.2 Actors

- User who needs emergency assistance.
- Mobile device initiating emergency response center to send emergency location request to network
- Authorized Service Provider (e.g., PSAP, Call centers) requests location of mobile device or mobile devices within emergency area from network to dispatch emergency services
- Network Operator sends physical location of mobile device in distress

5.9.2.1 Actor Specific Issues

- Network operator has prior arrangements defined with the authorized emergency service providers, e.g., PSAPs and call centers.

5.9.2.2 Actor Specific Benefits

- User in the emergency situation is able to summon emergency assistance that identify the location of the user.

5.9.3 Pre-conditions

- Service Provider determines the emergency area.
- Service Provider may broadcast the emergency message through CBS.

5.9.4 Post-conditions

- Based on the configuration of the service, periodic positioning attempts may be made to further refine and ensure accuracy of earlier location estimate, e.g., determination of direction may be made in successive positioning attempts. Any further detail on location that is determined may be provided to emergency dispatch to aid them in locating their victims.

5.9.5 Normal Flow

1. User runs emergency services application from a Service Provider to summon emergency assistance.

2. Network authenticates the service provider.
3. Service provider sends request for mobile device's physical location to the network.
4. Network responds with physical location of the mobile device.
5. Emergency services are dispatched with the proper location of the mobile device

5.9.6 Alternative Flow

- Mobile device sends its location directly to Service Provider (per national regulations)
- Authorized emergency center may request the location(s) of available mobile device(s) located within a defined emergency area.

5.9.7 Operational and Quality of Experience Requirements

- It is important that this capability be extremely easy to use and yet be flexible, powerful, precise and with minimal response time (i.e. highest priority among location-related services). This being said, privacy, billing and nuisance/non-emergency issues need to be considered for the deployment of this capability.

5.10 Use Case I&E, Friend Finder

	Affected Areas				
	Device	Connectivity	Enabling Services	Applications	Content
Tickmarks (X)	X		X	X	
Additional Keywords					

Table 10: Affected Areas for Friend Finder

5.10.1 Short Description

Capability: Identifying where someone else is located, i.e. “where is x”. This use case describes the basic capability to inquire where other mobiles are located. This functionality is integral to Friend Finder-type applications.

A user wants to find out where his friend is located and initiates a query on his mobile device to request his friend’s location.

5.10.2 Actors

- User who wants to know where his friend is currently located.
- Device providing the friend’s physical location
- Network Operator / Service Provider sends the physical location of his friend

5.10.2.1 Actor Specific Issues

- User who initiates the query is authenticated and his/her friends would need to have granted the initiator access to their location.

5.10.2.2 Actor Specific Benefits

- Users in a ‘friend’ group can access each other’s location

5.10.3 Pre-conditions

- Friend has approved that his location can be sent to the initiator. Note: User (initiator) and target (friend) are not the same in this use case.

5.10.4 Post-conditions

- Location of friend is provided.

5.10.5 Normal Flow

1. User runs MLS application to acquire his friend’s location.
2. The Network Operator / Service Provider sends the physical location of his friend.
3. Mobile device provides friend’s location information on a map.

5.10.6 Alternative Flow

- When requested by the initiator a ‘friend’ has specified that he/she may not be reached. In this alternative flow, the location query is ‘rejected’ due to privacy issues.
- Another alternate flow occurs when the ‘friend’ is not found. In this flow the user obtains an appropriate response.

5.10.7 Operational and Quality of Experience Requirements

- Privacy is critical for this capability to be accepted. For example, it may be possible that queries of a certain precision may only be allowed thus the location of a friend may not be provided beyond a pre-specified limited accuracy-level.

5.11 Use Case I&E, Location-enabling client applications

	Affected Areas				
	Device	Connectivity	Enabling Services	Applications	Content
Tickmarks (X)	X		X	X	X
Additional Keywords					

Table 11: Affected Areas for Location-enabling client applications

5.11.1 Short Description

Capability: Location-enabling client applications to allow applications to provide location of the client to a server. One example is to location-enable a web browser to get location-sensitive personalized content. This use case describes the capability of a web browser that provides access to location-sensitive web content based on his current (or specified) location.

Note: This use cases illustrates a web browser being location-enabled, however, any client application can be location-enabled, providing client location to a server over the Internet.

A user wants to surf the Internet and would like to have the web sites he visits be personalized to his current physical location (or specified location). He would like to have this capability in accordance with his privacy and user preference settings.

5.11.2 Actors

- User who wants to view personalized web content based on his current (or specified) physical location
- Mobile device capable of sending location information to web sites so personalized content can be delivered.

5.11.2.1 Actor Specific Issues

- Location-enabled applications provide location of the client to other parties only upon the consent of the user.

5.11.2.2 Actor Specific Benefits

- User is able to obtain location-sensitive information & services, thus enriching his/her Internet experience.

5.11.3 Pre-conditions

- User has specified privacy and user preferences and may have allowed permission for only specific sites to obtain his location information. Only user-authorized location-enabled applications are allowed to provide location.

5.11.4 Post-conditions

- Location is provided to the authorized entity.

5.11.5 Normal Flow

1. User runs MLS client browser on his mobile device to surf the web
2. Client browser on mobile device provides the user's location to web sites (based only on user's privacy settings) which results in the user viewing personalized web content based on his physical location

5.11.6 Alternative Flow

- Location that is provided to authorized entities may be limited to a certain level of accuracy, e.g., accuracy limited to 1km.

5.11.7 Operational and Quality of Experience Requirements

- Response time for location-enabled applications to convey the location to authorized entities is important so that this capability does not detract from the user's experience. For example, user's web surfing experience should not be negatively affected by this capability.

5.12 Use Case I&E, Location Alert

	Affected Areas				
	Device	Connectivity	Enabling Services	Applications	Content
Tickmarks (X)	X		X	X	
Additional Keywords					

Table 12: Affected Areas for Location Alert

5.12.1 Short Description

Capability: Alert notification when pre-specified location condition is triggered. This use case describes the capability to notify a user when his friend approaches a specified zone.

A user wants to be notified when his friend arrives at the school so he runs an MLS application to alert him accordingly.

Note: This use case also applies to the requesting user, e.g., a user may want to be alerted when he/she enters a pre-specified area.

5.12.2 Actors

- User who wants to be notified when his friend arrives at school.

5.12.2.1 Actor Specific Issues

- User is authorized to track the location of his friend and be alerted when the friend's location meets a pre-specified condition.

5.12.2.2 Actor Specific Benefits

- User and friend benefit by this alert mechanism, e.g., to allow them to meet.

5.12.3 Pre-conditions

- Friend has approved that his location can be sent to the user

5.12.4 Post-conditions

- User is notified via an alert when his/her friend's location meets the pre-specified condition.

5.12.5 Normal Flow

1. User runs MLS application to notify him when his friend arrives at school (predefined POI).
2. Friend arriving at school triggers the MLS application to notify the user.
3. Mobile device provides notification to the user indicating arrival of his friend at the school.

5.12.6 Alternative Flow

- User being requested for his/her location rejects all such requests. In this case the initiator does not get alerted when the user's location matches the pre-specified location.

5.12.7 Operational and Quality of Experience Requirements

- As with other usages described in this document, user's privacy is of paramount importance. Thus, only users that are authorized may be able to obtain their friend's location, based on the privacy level established by the friend being located.

5.13 Use Case I&E, Navigation Service

	Affected Areas				
	Device	Connectivity	Enabling Services	Applications	Content
Tickmarks (X)	X		X	X	
Additional Keywords					

Table 13: Affected Areas for Navigation Service

5.13.1 Short Description

Capability: Navigation service. This use case describes the capability to show specialized location based services combined with the location of a vehicle to its driver and owner who requests the services using his location enabled mobile device. Navigation service has many applications such as navigation, route finding, detouring information, traffic information etc.

5.13.2 Actors

- User who wants to arrive at his/her destination in time, e.g., he/she want to know the best route information to his/her destination when he/she drives
- A GPS embedded mobile device with the capability of saving location information
- Service provider who offers navigation services, such as the best route information, traffic congestion information, nearby restaurants and so on.

5.13.2.1 Actor Specific Issues

- User who wants navigation assistance is the initiator of a capability offered by his/her mobile device and/or by a service provider. The user's location is shared among the actors and is governed by the user's privacy preferences.

5.13.2.2 Actor Specific Benefits

- User benefits by obtaining the requested location-sensitive information provided by his/her mobile device and/or a service provider.

5.13.3 Pre-conditions

- Mobile device shows the direction by an arrow (turn-by-turn system), text and voice.
- Mobile device saves the location information such as route, traffic, and POI.

5.13.4 Post-conditions

- Saved location information could be used as offline navigation services performed by terminal itself.

5.13.5 Normal Flow

1. End user (driver) wants to know the best route information to his/her destination.
2. Service provider shows route information, directions in the cross roads and in main streets from the starting point to the described destination.
3. Mobile device saves the route information (directions, particular data and so on) to a terminal.
4. Acquiring current location by GPS embedded mobile device, user drives following the displayed direction in mobile device screen with an arrow.
5. User arrives at his destination.

5.13.6 Alternative Flow

1. When the user goes back to the starting point, mobile device sets up reverse mode, simply reversing already saved direction vectors and route order.
2. Mobile device acquires current location by GPS receiver and offers the returning direction by itself, with and/or without assistance of service provider.

5.13.7 Operational and Quality of Experience Requirements

- Response time is important for this capability to become attractive to users. Also the location-relevant information that accompanies the location may be of more importance than the location itself and thus should be easy to use.

5.14 Use Case Other, User-friendly output

	Affected Areas				
	Device	Connectivity	Enabling Services	Applications	Content
Tickmarks (X)	X		X	X	X
Additional Keywords					

Table 14: Affected Areas for User-friendly output

5.14.1 Short Description

Capability: Usage of graphical, textual, or spoken output for location information to improve user experience

This use case describes a very generic scenario to simply present the basic idea of a user-friendly way of presenting location information to a user, a use case which is orthogonal (and complementary) to many others in that it deals with the **representation** of the result rather than the response content or the capabilities of LS (Location Services) in general.

5.14.2 Actors

- User requesting location info for one or more targets
- End-user device for accessing LS
- One or more persons which are represented by their mobile devices
- Application Providing Entity (APE) – formerly known as service provider

5.14.2.1 Actor Specific Issues

- From a user's point of view consistency and coherence of the presentation (format) *across applications* is important, e.g., same color and line style for roads of the same category.
- The quality of the positioning method, e.g., accuracy, must be sufficient to meet the users' goal.

5.14.2.2 Actor Specific Benefits

Users can be sure that the result fits best their needs. Examples include:

- People with disabilities, e.g., blind people get spoken output rather than textual one.
- Multiple, adjacent positions can be best presented on a map
- The specification of a street crossing in terms of street names is – at least for a human being - preferable to a pair of x and y coordinates.

5.14.3 Pre-conditions

- Terminal capabilities or user preferences are either specified in the user profile and/or given in the actual request

5.14.4 Post-conditions

- User experience is improved by targeting it to the specific user.

5.14.5 Normal Flow

1. User device sends the service request with the quality of service to APE (application providing entity)
2. The APE returns the result to the user device

5.14.6 Alternative Flows

- If the user does not specify the quality of service to the application providing entity, a default is determined based on connectivity and other available infrastructure/mobile device information.

5.14.7 Operational and Quality of Experience Requirements

- The capability to provide location information in a form that is easily understood by the user is vital for the successful adoption of value-added location services. As in other cases, the response time for location query and responses should be kept at a minimum.

5.15 Use case I&E, Report of Pseudo-Location based on User Profile

	Affected Areas				
	Device	Connectivity	Enabling Services	Applications	Content
Tickmarks (X)	X		X	X	
Additional Keywords					

Table 15: Affected Areas for Report of Pseudo-Location based on User Profile

5.15.1 Short Description

Capability: Report of Pseudo-Location based on User Profile. This use case describes the capability for location enabler to provide users with a mechanism to return a pseudo-location (i.e., abstract location) based on the user's profile settings and the user's current physical location. Emergency services and lawful purposes can override any user preference setting.

For example, a user may specify a 'home' profile that describes the location range of his/her home. When a request is made for his/her location, a comparison is made between the user's pre-set profile and the actual physical location of the user. If the current actual location matches the pre-set profile for 'home' then the user-specified location ("pseudo-location") is returned, e.g., zip code, city, etc.

5.15.2 Actors

- A user who wants to report a pseudo-location (i.e. abstract location) based on his/her profile settings and his/her current physical location when there is a request of his/her location
- Mobile device capable of allowing user profile information to be viewed and edited by the authorized user
- MLS application requesting location of user

5.15.2.1 Actor Specific Issues

- User determines the pseudo-location provided.

5.15.2.2 Actor Specific Benefits

- Allows the user to flexibly reveal only a pseudo-location (i.e., abstract location) based on his/her profile settings (i.e., preferences) when the user is physically located in specific locations, e.g., locations that the user deems as private, e.g., home, school, etc.

5.15.3 Pre-conditions

- Network connectivity for obtaining external location requests (note that location requests can also come from MLS applications on the user's mobile device in which case the network connection for obtaining location requests is not needed)
- Verification is performed to authenticate a user.
- User profile for pseudo-location report is set by an authorized user.
- Positioning capability in the mobile device or in the network

5.15.4 Post-conditions

- Pseudo-location (i.e., abstract location) returned to the requesting MLS application based on his/her profile settings and his/her current physical location.

5.15.5 Normal Flow

1. User selects functionality to view and edit his/her profile settings.
2. User sets his/her profile for report of the pseudo-location, e.g., defines “home” location range.
3. MLS applications request user’s location with specific QoS, e.g., using OMA MLP an external MLS application requests user’s location specifying the location with a specific accuracy level.
4. User is positioned with standard positioning mechanisms.
5. If the user’s physical location overlaps with the pre-specified range the pre-specified pseudo-location is returned to the requesting MLS application. (Note: For lawful/emergency requests this functionality is bypassed and only the true physical location is returned).

5.15.6 Alternative Flow

- If no pseudo-level of location is given then a default one may be employed.

5.15.7 Operational and Quality of Experience Requirements

- This capability provides the users with flexibly responding to queries without revealing their exact current location. As has been indicated in prior use cases, user privacy is paramount for the wide adoption of location services.

5.16 Open Issues

None at this time.

6. Requirements (Normative)

6.1 High-Level Functional Requirements

6.1.1 General

1. **Service Categories: Mobile Location Services (MLS) SHOULD be available for value-added commercial applications as well as for emergency service applications, initiated from the mobile device, service provider or other authorized user/entity.**
 - Note that privacy restrictions are different for both commercial and emergency applications.
 - Minimally two types of location requests SHALL be provided: immediate (on-demand) and deferred (periodic and event-based). The latter type establishes the base for tracking applications.
2. **Platform Independence: MLS SHALL be applicable across multiple mobile platforms (e.g., handsets, PDAs and laptops), across multiple networks (WWANs, WLANs, etc.) and across various environments (i.e., indoors, outdoors).**
3. **Positioning Technology Independence: MLS SHALL support multiple positioning technologies, both mobile-based and network-based.**
 - Note that in cases where network connectivity is non-existent, standalone methods MAY be employed to provide mobile positioning.
 - This requirement includes the necessary transfer of assistance information and/or measurement data exchanged between a service provider and the target mobile that is required for certain positioning methods.
4. **Reliability: MLS SHALL provide reliable access to location information, contingent on the stability of the underlying transport network and positioning capability.**
 - Note that reliability refers to the number of successful location estimates made that match the negotiated QoS.
5. **Information Exchange: MLS SHALL provide the ability for users to share their location information, i.e., applications resident on mobile devices SHALL be capable of sharing the physical location of the device with another application on another mobile device, provided that prior authorization consent is given from both parties.**
6. **Location exchange between mobile-resident applications: MLS SHALL provide the capability for a mobile resident application to share location information of the mobile device with other authorized mobile resident applications.**
 - Note that the term ‘mobile-resident applications’ in this requirement refers to client-side applications that are either embedded or downloaded to the mobile.
7. **Location Aware Client Applications: MLS SHALL provide the ability for mobile location-based applications (e.g. terminal browsers) to access the location of the mobile device and provide its location to visited Internet sites, consistent with the end-user’s privacy settings.**
8. **Service Discovery: MLS SHALL provide the capability to discover available location-related services.**
 - Note that this includes discovery of basic services that aid in computing location, such as network servers providing location assistance services.
9. **Application Download: MLS SHALL provide the ability for end-users to select and download location-related applications and content to a mobile device from a service provider.**

- 10. Location Tracking: It SHALL be possible to track the location of an end-user (including self) for a specified time period, provided that the end-user being tracked has provided sufficient authorization to the requestor to perform the tracking service.**
- Note that the only exceptions to obtaining prior authorization are for emergency reasons or lawful purposes depending on local/regional regulations.
- 11. Basic Location Service: MLS SHALL provide the ability for an end-user to query the location of other mobile devices.**
- 12. Deployment of MLS: MLS SHALL support an easy, flexible, and interoperable deployment consistent with other OMA specification/guidelines, e.g., at present those of the Mobile Web Services WG**
- 13. Charging: MLS SHALL allow the ASP to apply different charging schemes depending on the location technique and content presentation used.**
- Note that the cost of MLS to an end-user is a QoS parameter which is negotiated between the end-user application and the network.
- 14. MLS SHALL, if peer to peer location exchange capability is supported, provide the ability for a mobile device to relay location information to another mobile device.**
- Note that this capability requires that both peer mobiles have permitted the exchange to occur, ensured that end-user privacy rules are upheld.
- 15. MLS SHALL be made adaptable to different legislative environments and variable security requirements so that it is legal to deploy and use enabling applications utilizing location information under the laws of different countries.**
- MLS does not restrict additional requirements to be applied on regional basis, but the requirements possibly limiting the deployments and/or business in certain regions SHALL NOT be applied for OMA Location Enabler.
 - Examples of legal requirements that could be considered by the Location Enabler include:
 - Privacy override by authorized instances (e.g., police).
 - Caching of position information may be not allowed in some countries; hence Location Enabler shall not mandate such a function.
 - Law in certain countries forbids bundled trading.
 - MLS shall not mandate separate functions or services to be provided by certain same party in value chain, but those separate services or functions are enabled to be provided by separate, independent business models.

6.1.2 End-user

- 16. Quality of Service: An end-user SHALL be able to specify the desired Quality of Service (QoS), including but not limited to accuracy and response time, in requesting the location of the mobile device.**
- The requested QoS MAY not be guaranteed and is negotiated between the mobile device and the network; however, Mobile Location Services (MLS) SHOULD attempt to satisfy the desired QoS whenever possible.
 - Emergency services MAY elect to either minimize response time or maximize location accuracy.
 - Note that minimizing response time for immediate queries SHOULD be a design goal in any solution offering Mobile Location Services
- 17. High service availability: The service availability SHALL be a QoS option for Mobile Location Services. Service availability depends on the reliability of underlying transport mechanisms.**

- Availability for Emergency Services SHALL be maximized and thus these services SHALL be allowed to pre-empt non-emergency MLS.
- Note that minimizing service disruption SHOULD be a design goal in any solution offering MLS.

18. High data quality: As Mobile Location Services is time-sensitive, all MLS events and transactions SHALL be time-stamped and SHALL use the most recent up-to-date data available.

- The content of the service SHALL be based on up-to-date data. Consistency and coherency are other important factors.

19. High-value services: MLS SHALL provide additional presentation formats to the existing plain x/y coordinates as provided by the current MLS standard.

- Note that not only the presentation aspect but also the type and content of these services offered SHALL go beyond the simple provisioning of location information.
- “Report of pseudo-location based on user profile” describes the capability for location enabler to provide users with a mechanism to return a pseudo-location (i.e., abstract location) based on the user’s profile settings and the user’s current physical location.
- ”Advanced geographical services” include but are not restricted to navigation and routing services; provisioning of maps; search and information about POIs (points of interest); geocoding and reverse geocoding services (translation from x/y coordinates to, e.g., street names or POIs; and searching services.

20. Data integrity and security: MLS SHALL deliver its content in a trustworthy and reliable manner, e.g., Location information SHALL be protected against eavesdropping or modification of the data traffic.

21. Roaming: Mobile Location Services SHALL provide access-independent, uninterrupted service while roaming across IP-based wireless networks, contingent upon the reliability of underlying transports and mutual agreement and supporting infrastructure from participating service providers.

- As roaming for voice calls is a standard feature today, this will also hold for Mobile Location Services so that both users and applications can be located in different wireless networks.

22. MNP (Mobile Number Portability): End-user’s privacy settings are associated with the user and thus the end-user privacy settings SHALL be maintained through roaming scenarios across wireless networks.

- In line with the roaming requirement, a user SHALL be able to change his home mobile operator, keep her phone number and still be able to use location services without any changes in her subscriber settings.
- In a similar manner if the subscriber is the target of a location request there SHALL be no need to modify her privacy settings as well.

23. Easy administration of MLS: From a user’s point of view it SHALL be simple to maintain (specify, view and update) a user’s profile which affects many aspects of MLS, e.g., privacy settings as well as default configuration values that are applicable across all Mobile Location Service transactions on the mobile device as well as the network.

- It SHALL be easily possible to enable or disable MLS in general (applies to the role of being a location target), e.g., via a mobile device.
- For administration of MLS (applies to target and requestor role) more advanced interaction capabilities are needed, e.g., via a more complex web based GUI for detailed settings.
- Emergency services and lawful interception are an exception and these services SHALL not be enabled/disabled by the user.
- Note that the settings may be multi-tiered depending on implementation, e.g., various levels of location accuracy can be provided to applications and requestors depending on their authorization level.

- 24. Interaction:** The input and output (content presentation) SHALL take into consideration the entries in the client profile and the terminal's capabilities, e.g., usage of the user's native language; output in spoken form for blind people; usage of graphics wherever reasonable; etc.
- 25. Unified billing:** End-users receiving Mobile Location Services SHALL be provided with a single unified bill from their service provider who aggregate all charges incurred for MLS services rendered.
- Note that service providers include, among others, WWAN operators and WiFi providers.

6.1.3 Terminal

- 26. Capability:** The terminal SHALL have sufficient resources to use MLS properly, e.g., support of various transportation protocols, high-resolution graphics, ample processing power and memory.
- 27. Application provision:** The terminal SHALL provide pre-installed MLS application or provide the capability to download applications on demand.
- 28. Self-Location:** Applications resident on mobile devices SHALL be capable of accessing the device's current physical location (i.e., "where am I" query).
- This location request MAY involve interaction with the network ("assistance data") or MAY be fully autonomous.

6.1.4 Privacy & Security

- 29. Authentication:** It SHALL be possible to authenticate the user (client and service) of an MLS request.
- 30. Notification:** Whenever a target is being located it SHALL be notified of this positioning attempt (incl. more information of the requesting party) and potentially asked for acceptance, based on the target end-user's privacy settings, with the exception of emergency and lawful purposes.
- 31. Privacy Protection:** Mobile Location Services SHALL ensure that the end-user's privacy is protected in all transactions consistent with the user's privacy profile, except for emergency or lawful purposes depending on local/regional regulations.
- Note that multiple layers of privacy protection MAY be provided.
 - Note: for general privacy requirements, refer to OMA Privacy Requirements document [OMA_Priv]
- 32. Anonymization:** As another means to protect the privacy of the target all references to the target SHALL only be known to entitled parties.
- Note that entitlement is established by the target end-users based on their privacy requirements or by lawful entities.
- 33. Information Hiding:** The User's identity and usage information SHALL not to be disclosed to content providers and to other parties without explicit consent of that user, except for lawful purposes.
- 34. Secure Information Handling:** MLS SHALL ensure that any location information that is stored or exchanged is secure and thus is not accessible to unauthorized access, i.e., unauthorized disclosure, usage, loss or corruption of location data is prevented.
- If MLS provides the ability for the end-user to store location information, the location data SHALL be stored in a secure manner and SHALL be available for retrieval by authorized applications.
 - Note that the authorization here is governed by the end-user's privacy requirements (i.e. user privacy preferences/profile) and local regulations. Access to the stored location data SHALL only be accessible to those applications that are authorized by the end-user.

- Emergency services and for lawful purposes are exempted from this requirement in that they can override any user privacy preference setting.

35. MLS SHALL allow the use of a general and synchronised privacy framework.

- Note that both application and Location Server can be part of several domains: mobile operator network, IT domain or device domain. Therefore, several service architectures can be derived from these three domains.
- As both the application and the Location Server can be part of the above mentioned domains, the same level of privacy management SHALL be performed for all service architectures.

6.1.5 Location Information

36. Location information SHALL minimally consist of latitude, longitude and timestamp (time at which location estimate is made) but MAY contain a wide array of information, including altitude, speed, direction, QoS, reverse geo-coded information (address), point of interest (POI), maps, etc.

37. MLS SHALL provide the capability for applications to retrieve location information from a service provider in the network or from the mobile device, contingent on the authorization to access the data.

38. MLS SHALL allow for Point of Interest (POI) information to be included as part of location information, as requested by authorized applications, if POI handling is supported by the mobile device or by the service provider in the network.

- Note that the POI information MAY be obtained from the network or from the mobile device itself (e.g., previously stored POI information on the mobile device).

39. MLS SHALL allow the transfer of Advanced Geographic Description (AGD) data, if such data is supported, in situations that involve transfer of location related information.

- Note that AGD in the above requirement is defined as any geographic/geo-spatial information that provides important semantic or contextual information for a geographic position on the earth. For example: it can be related to a particular location defined in terms of points, area or volume on the Earth, particularly giving information on natural phenomena, cultural, political and human resources.

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-RD-LOC_ArchOverview-V1_0	2003 Aug 01	All	Initial draft taken from OMA RD template
	2003 Sep 30	5.14 & 5.15	Re-labeled document to v1.0 for baseline Added User Friendly Output & Navigation Service use cases
	2003 Nov 02	All	Renaming of document according to PDN
	2003 Nov 02	All	Added approved requirements to RD baseline
	2003 Nov 18	All	Incorporated into new RD template (20030912), abbreviations, definitions and privacy synchronization requirement
	2004 Apr 27	All	Incorporated into new RD template (20040205), updates per Req WG RDRR, and addition of Req 5, 6 and 39.
	2004 June 21	All	Completed updates per RDRR comments.
	2004 Oct 20	All	Incorporated CR 146r02: Report of pseudo-location based on user profile use case. Finalized RDRR updates. Applied new naming scheme for permanent documents.
Candidate Versions OMA-RD-LOC_ArchOverview-V1_0	18 Nov 2004	n/a	Status changed to Candidate by TP TP ref# OMA-TP-2004-0381- Location_Arch_Overview_RD_for_approval
	29 Feb 2008	n/a	Status changed to historic OMA-TP-2007-0434- INP_Move_WID_0039_LOC_ARC_Overview_to_Historical_state