



Look and Feel Customization Architecture

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Contents

1. SCOPE (INFORMATIVE)	4
2. REFERENCES	5
2.1 NORMATIVE REFERENCES	5
2.2 INFORMATIVE REFERENCES	5
3. TERMINOLOGY AND CONVENTIONS	6
3.1 CONVENTIONS	6
3.2 DEFINITIONS	6
3.3 ABBREVIATIONS	6
4. INTRODUCTION (INFORMATIVE)	7
4.1 VERSION 1.0	7
5. ARCHITECTURAL MODEL	8
5.1 DEPENDENCIES	8
5.2 ARCHITECTURE DIAGRAM	8
5.2.1 Generic Architecture Diagram.....	8
5.2.2 LFC Lightweight Model Architecture Diagram	9
5.3 FUNCTIONAL COMPONENTS AND INTERFACES (NORMATIVE)	9
5.3.1 Functional Components Specified by this Enabler	9
5.3.2 Other Enablers and Components	10
5.3.3 Interfaces Specified by this Enabler	10
5.3.4 Other Interfaces	11
5.4 SECURITY CONSIDERATIONS	11
5.4.1 Authentication and Authorization.....	11
5.4.2 Integrity of LFC Element Settings and LFC Packages	11
APPENDIX A. CHANGE HISTORY (INFORMATIVE)	12
A.1 APPROVED VERSION HISTORY	12
A.2 DRAFT/CANDIDATE VERSION 1.0 HISTORY	12
APPENDIX B. FLOWS (INFORMATIVE)	13
B.1 LIGHTWEIGHT MODEL FLOWS	13
B.1.1 LFC Package Delivery (Normal Flow 1).....	13
B.1.2 LFC Package Delivery (Normal Flow 2).....	13
B.2 REMOTE MANAGEMENT MODEL FLOWS	13
B.2.1 Normal Flow- LFC Package Delivery	13
B.2.2 Alternative Flow - 1	13
B.2.3 Remote Management Operations on the device.....	14

Figures

Figure 1: LFC Generic Architecture Diagram	8
Figure 2. LFC Lightweight Model Architecture Diagram	9

1. Scope

(Informative)

This document defines the architecture of Look and Feel Customization (LFC) Enabler. This architecture is based on the requirements listed in the LFC Requirement Document [OMA-LFC-RD].

2. References

2.1 Normative References

- [OMA-LFC-RD] “Look and Feel Customization Requirements”, Open Mobile Alliance™, OMA-RD-LFC-V1_0, URL:<http://www.openmobilealliance.org/>
- [OSE] “OMA Service Environment”, Open Mobile Alliance™, 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

- [DMPRO] “OMA Device Management Protocol”, Version 1.2, Open Mobile Alliance, OMA-TS-DM_Protocol-V1_2, URL:<http://www.openmobilealliance.org/>
- [OMADICT] “Dictionary for OMA Specifications”, Version 2.7, Open Mobile Alliance™, OMA-ORG-Dictionary-V2_7, 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

LFC Content Server	An entity that supports the delivery of LFC Packages to an LFC enabled device
LFC Element	One characteristic of a device’s LFC (e.g. screen saver, incoming data message alert, ringtone per caller, etc).
LFC Element Settings	The combination of an LFC Element and an associated value for it
LFC Management Server	An entity that issues and handles the commands to perform Remote Management operations to an LFC enabled device
LFC Operations	Operations targeted on LFC Packages or LFC Element Settings which may be invoked on an LFC Client.
LFC Packages	Group of LFC Element Settings that are part of the device’s Look and Feel. This package is used by a Service Provider to describe part or the whole Look and Feel Customization of the device.
LFC Server	Is an entity that supports LFC Operations in response to LFC Client's requests. Examples are LFC Management Server and LFC Content Server
Look and Feel	Appearance and behavior of the device’s user interface.
Look and Feel Customization	Process by which all or part of a device’s Look and Feel is modified
Management Object	A data model for information which is a logical part of the interfaces exposed by DM components.
Remote Management	LFC Operations originating from an entity residing on the network to be performed on an LFC capable device
Secure Removable Card	It refers to secure physical devices able to be inserted to and removed from terminal equipments. These devices must be able to protect not only logically but physically the data and/or applications they carry. Typical Secure Removable Cards in the LFC are the UICC’s (see [OMADICT])
User Agent	Any software or device that acts on behalf of a user, interacting with other entities and processing resources

3.3 Abbreviations

DLOTA	DownLoad Over The Air
DM	Device Management
FTP	File Transfer Protocol
HTTP	HyperText Transfer Protocol
LFC	Look and Feel Customization
OMA	Open Mobile Alliance
SRC	Secure Removable Card

4. Introduction

(Informative)

The LFC enabler allows Customization of a device Look and Feel. The main objective of the enabler is to allow different entities in a mobile environment such as service providers, network operators, handset manufacturers, enterprises or device owners or device users, to configure the device Look and Feel according to their own requirements and what they are allowed (or have credentials/permissions) to customize. It is also an objective that the LFC enabler must be able to address Look and Feel Customization for all type of devices ranging from low-end, feature phones, smart-phones to more advanced devices.

In addition, the objective of this document is to define the functional components and interfaces for LFC Architecture. The architecture of LFC enabler is mainly composed of LFC Client, LFC Content Server and LFC Remote Management Server. Depending on the selected models [OMA-LFC RD], additional entities like User Agent, Delivery Client, SRC, DM Client and DM Server can be defined.

Each component will have its own functionalities which may be defined within LFC enabler, or may reuse other OMA Enablers and / or existing standards features.

4.1 Version 1.0

The LFC V1.0 enabler supports the Lightweight Model and Remote Management Model. The Lightweight Model is mandatory and the Remote Management Model is optional. Both models support LFC Package operations. LFC Element Setting is not supported in the LFC V1.0 enabler.

This LFC V1.0 enabler provides the following main functionalities depending on the model applied:

- For the lightweight model which is the mandatory part of this enabler:
 - Delivery of LFC Packages from the LFC Content Server
 - Installation of the LFC Package on the device by LFC Client
 - Activation and deactivation of LFC Package
 - Removal of LFC Package
- For the Remote Management model which is optional in this release, the main functionalities in addition to those mentioned above are:
 - Query of LFC Packages
 - Update of LFC Packages
 - Activation and deactivation of LFC Packages
 - Locking and unlocking LFC Package
 - Query LFC Package
 - Marking default LFC Package

5. Architectural Model

5.1 Dependencies

The LFC 1.0 generic architecture diagram (Figure 1) covers all models described in [OMA-LFC-RD] and indicates optional dependencies on existing download methods such as DLOTA, HTTP, FTP etc.

The Lightweight architecture diagram (Figure 2) depicts only dependencies relevant to the Lightweight Model.

If Remote Management model is supported, LFC 1.0 architecture diagram also depends upon the OMA-DM enabler.

5.2 Architecture Diagram

5.2.1 Generic Architecture Diagram

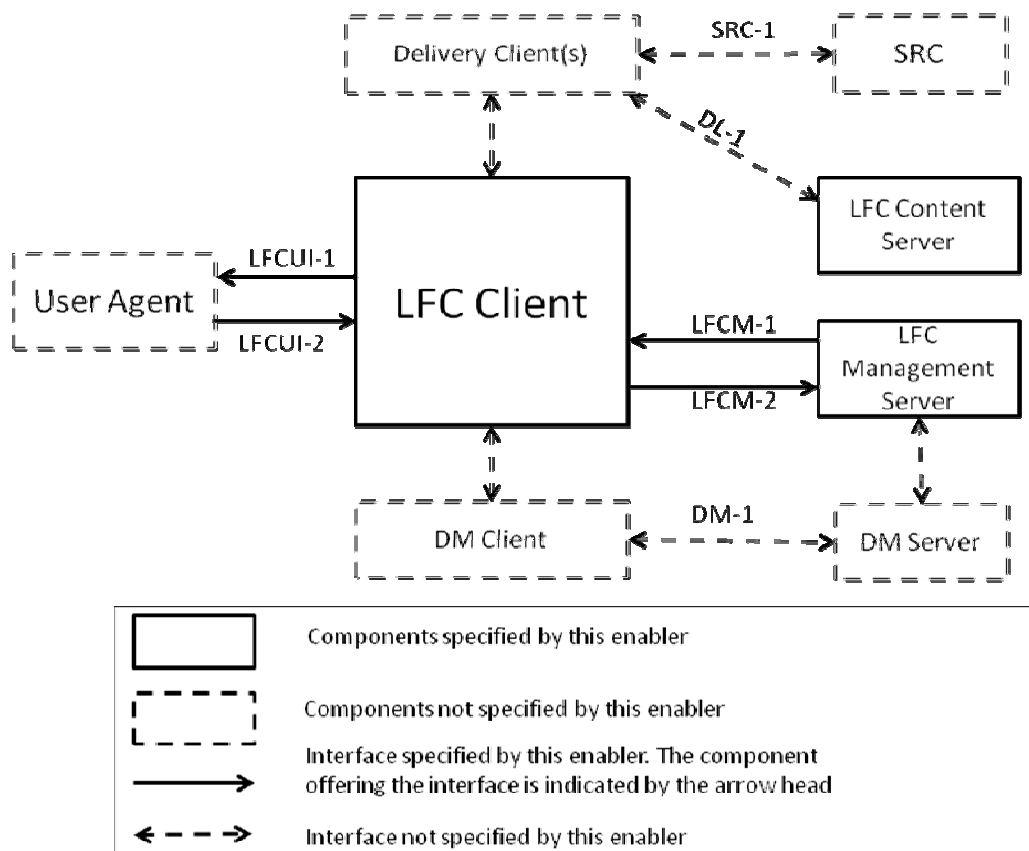


Figure 1: LFC Generic Architecture Diagram

5.2.2 LFC Lightweight Model Architecture Diagram

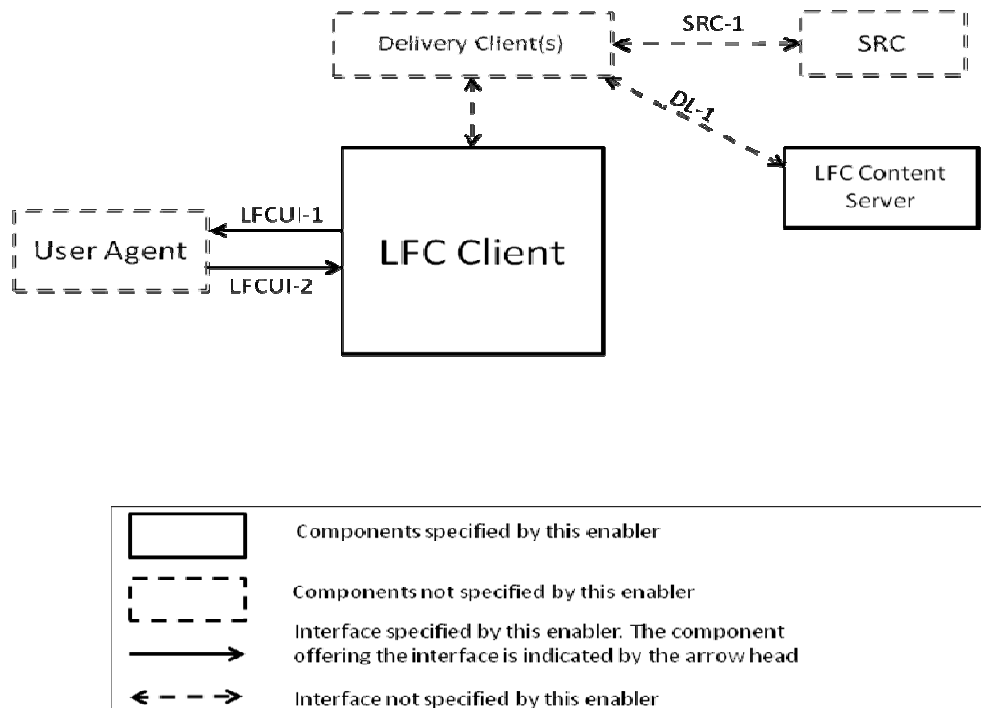


Figure 2. LFC Lightweight Model Architecture Diagram

5.3 Functional Components and Interfaces (Normative)

5.3.1 Functional Components Specified by this Enabler

5.3.1.1 LFC Content Server

The LFC Content Server is a logical entity which is dedicated to provide the LFC Package metadata and LFC Packages to the device

5.3.1.2 LFC Management Server

The LFC Management Server is a logical entity which is dedicated to issue LFC Operations to the device and consume the notifications of these LFC Operations outcome

5.3.1.3 LFC Client

LFC Client is an entity that resides in the device. In the lightweight model [OMA-LFC-RD], LFC Client is responsible for the installation of LFC content as requested by the User Agent. LFC Client is also in charge of initiating delivery operation related actions by communicating with Delivery Client(s).

In the remote management model [OMA-RD-LFC], LFC Client provides responses to management activities on LFC Packages and LFC Element Settings according to LFC Operations received from the LFC Management Server. LFC Client is also responsible for notifying the outcome of LFC Operations to the initiator of those LFC Operations

5.3.2 Other Enablers and Components

5.3.2.1 DM Server

The DM Server is an entity which conveys the appropriate device management operations to the device over various bearer technologies, represented by the DM-1 interface. It can also receive specific alerts from the DM Client for success or failure of management activities

5.3.2.2 DM Client

The DM Client is an entity which makes it possible for the DM Server to manage the device using the DM protocol defined in [DMPRO]. The DM Client can access the Management Object provided by the LFC Enabler such that the DM Server can manipulate it. The DM Client employs the DM Generic Alert mechanism [DMPRO] to send the result of the management activities to DM Server.

The LFC Management Object is the management object representing LFC device's information exposed for LFC Remote Management purposes. The LFC Management Object can also be used to expose the inventory of installed LFC Packages and LFC Element Settings. The LFC Management Object is exposed by the DM Client through its DM tree.

5.3.2.3 User Agent

The User Agent is a logical entity which receives user authorization requests from the LFC Client. The User Agent presents the request to the user for obtaining permission to proceed with the execution of LFC Operations and passes user's authorization responses back to the LFC Client.

The User Agent may also receive information from the LFC Client to report the user about the status of LFC Operations

5.3.2.4 SRC

The SRC is a removable card which is dedicated to store and provide LFC Packages to the device

5.3.2.5 Delivery Client(s)

The Delivery Clients are entities for retrieving LFC Package metadata and LFC Packages and forwarding them to the LFC client. These LFC Package metadata and LFC Packages may be subsequently consumed by the LFC Client. All interactions between LFC Client and LFC Content Server and / or SRC are carried out via Delivery Client(s).

When LFC Package is remotely provided the Delivery Clients may support DLOTA or other alternative download methods.

5.3.3 Interfaces Specified by this Enabler

5.3.3.1 LFCUI-1

The LFCUI-1 interface is exposed by User Agent and allows LFC Client to send the status of LFC Operations and user authorization requests related to LFC Operations to the User Agent.

5.3.3.2 LFCUI-2

The LFCUI-2 interface is exposed by LFC Client and allows the User Agent to send the user authorization responses related to LFC Operations to the LFC Client

5.3.3.3 LFCM-1

The LFCM-1 interface is exposed by LFC Client and allows LFC Management Server to issue LFC Operations. The LFC Operations will be conveyed by DM messages through underlying DM-1 interface.

5.3.3.4 LFCM-2

The LFCM-2 interface is exposed by LFC Management Server and allows LFC Client to send notifications about the outcome of LFC Operations to the LFC Management Server. These notifications will be conveyed by DM messages through underlying DM-1 interface

5.3.4 Other Interfaces

5.3.4.1 DM-1

The DM-1 interface is defined in the OMA DM Enabler. It provides an interface over which DM Server may send device management operations to DM Client and DM Client may return status and alerts to DM Server

5.3.4.2 DL-1

The DL-1 interface provides an interface over which LFC Content Server could send LFC Packages to the Delivery Client. The DL-1 interface will be implemented by existing transport mechanisms, such as DLOTA, HTTP, FTP etc.

5.3.4.3 SRC-1

The SRC-1 interface provides an interface between SRC and Delivery Client(s).

The SRC-1 interface will be implemented by existing transport mechanism, such as OMA-SCWS, HTTP, FTP, etc.

5.4 Security Considerations

5.4.1 Authentication and Authorization

LFC Enabler provides mutual authentication and authorization between the main LFC Enabler entities, such as LFC Client, LFC Content Server and LFC Remote Management Server. Only authorized principals will be able to perform LFC Operations.

In the case of Remote Management model [OMA-LFC-RD], the LFC enabler reuses security mechanisms and protections provided by the OMA DM enabler.

5.4.2 Integrity of LFC Element Settings and LFC Packages

LFC Enabler provides security mechanisms to protect LFC Elements Settings and LFC Packages against any unauthorized changes and modifications and also protects the full integrity of the LFC Packages

Appendix A. Change History

(Informative)

A.1 Approved Version History

Reference	Date	Description
n/a	n/a	No prior version –or- No previous version within OMA

A.2 Draft/Candidate Version 1.0 History

Document Identifier	Date	Sections	Description
Draft Versions OMA-AD-LFC-V1_0	08 Nov 2007	All	Initial draft template
	15 Nov 2007	All	Initial baseline document
	6 Dec 2007	All	Includes agreed changes from the conference call on 29th of November 2007
	3 Jan 2008	All	Includes agreed changes from the face to face meeting in London 13-14 December 2007 OMA-LFC-2007-0017R01-CR_Description_for entities and interfaces.doc
	15 Feb 2008	All	Includes agreed changes from the conference call on 7th of February 2008 OMA-LFC-2007-0017R01-CR_Description_for entities and interfaces.doc OMA-LFC-2008-0001R02-CR_Lightweight_Model Architecture_Diagram OMA-LFC-2008-0002R01-CR_Remote_Management_Flows OMA-LFC-2008-0003R01-CR_Introduction OMA-LFC-2008-0007-CR_OMA_DM Dependency
	7 Mar 2008	All	Includes agreed changes from the face to face meeting in Beijing 28-29 February 2008 OMA-LFC-2008-0009R01-CR_LFC_AD Lightweight Model Delivery_Flows OMA-LFC-2008-0015R02-CR_Security_consideration_for_LFC_AD
	18 Mar 2008	All	Includes agreed changes from the conference call on 13th of March 2008 OMA-LFC-2008-0013R01-CR_Changes_to_LFC client description_in_5.3.1.3
	28 Apr 2008	All	Includes agreed changes from the Paris face to face meeting 17 April 2008 OMA-LFC-2008-0027R02-CR_Description_for_section_4_1_of_LFC_AD OMA-LFC-2008-0028R01-CR_LFC_AD_clean_up OMA-LFC-2008-0031-CR_Diagram_Bug_Fix OMA-LFC-2008-0032R01-CR_DeliveryClient Description OMA-LFC-2008-0036-CR_Clarification_to_LFC Operation Performer OMA-LFC-2008-0038-CR_LFC_Clerical_Bug_Fix To AD OMA-LFC-2008-0039-CR_LFC_Metadata_Provisioning and Downloading_Description OMA-LFC-2008-0041-CR_Lightweight_Model_Delivery_Flows_Clarification OMA-LFC-2008-0042-CR_Confirmation_Authorization Cleanup
	30 Apr 2008	All	Includes agreed changes from the conference call 30 April 2008 OMA-LFC-2008-0044R01-CR_SRM_Architecture Diagram
	03 Jul 2008	All	Includes all agreed changes from the face to face meeting in Prague and the closed comments OMA-LFC-2008-0031-CR_Diagram_Bug_Fix OMA-LFC-2008-0045R01-CR_SecureRemovableToken
	17 Jul 2008	All	Nothing changed. Just to align the date with the LFC ADRR
	26 Aug 2008	All	Nothing changed. Just to refresh the dates after the discussion in Chicago and the agreement not to change anything.
	26 Mar 2009	All	Change it to conform to the 2009 template according to the agreed CR OMA-LFC-2009-0014R01-CR_AD_Update
Candidate Version: OMA-AD-LFC-V1_0	26 Jun 2009	All	Status changed to Candidate by TP: OMA-TP-2009-0269-INP_LFC_V1_0_ERP_for_Candidate_Approval Editorial fixes: History box, references sorted

Appendix B. Flows

(Informative)

B.1 Lightweight model flows

B.1.1 LFC Package Delivery (Normal Flow 1)

1. User Agent asks the LFC Client to download LFC Package
2. LFC Client sends download request to Delivery Client
3. Delivery Client downloads the metadata of the requested LFC Package from source location
4. Delivery Client sends user authorization request to the LFC Client and forwards the metadata of the LFC Package
5. LFC Client evaluates metadata received from the Delivery Client to verify against the device capability
6. LFC Client forwards user authorization request to User Agent.
7. User Agent sends user authorization result to LFC Client
8. LFC Client forwards authorization result to Delivery Client
9. Delivery Client downloads the LFC Package and makes it available to LFC Client

B.1.2 LFC Package Delivery (Normal Flow 2)

1. User Agent asks the LFC Client to download LFC Package
2. LFC Client sends download request to Delivery Client
3. Delivery Client downloads the LFC Package and makes it available to LFC Client

B.2 Remote Management model flows

B.2.1 Normal Flow- LFC Package Delivery

1. The LFC Management Server sends notifications to DM Server to deliver an LFC Package to the device.
2. The DM Server notifies the DM Client to initiate the DM session and the DM session is established.
3. LFC Management Server sends a deliver LFC Operation to the LFC Client over the DM session.
4. The LFC Client consumes the deliver operation and uses an appropriate download method to retrieve the LFC Package, as it is explained in lightweight model flows.
5. The LFC Client acknowledges the receipt of the LFC Package delivery and informs the LFC Management Server over the DM session.

B.2.2 Alternative Flow - 1

Step 1 and 2 are the same as in the normal flow

Step 3, LFC Management Server optionally performs, over the DM session, an LFC inventory query to determine the appropriate LFC Package

Steps 4, 5 and 6 are similar to steps 3, 4 and 5 in normal flow

B.2.3 Remote Management Operations on the device

1. The LFC Management Server sends notifications to DM Server to perform an LFC Operation to the device.
2. The DM Server notifies the DM Client to initiate the DM session and the DM session is established.
3. LFC Management Server sends the appropriate LFC Operation to the LFC Client over the DM session.
4. The LFC Client consumes the LFC Operation and performs the requested actions.
5. The LFC Client informs LFC Management Server about the result of LFC Operation over the DM session