Download Over-The-Air Requirements

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Open Mobile Alliance

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Contents

Tables

1. Scope (Informative)

The scope of OMA Download Over-the-Air (OTA) is procedures for enabling the downloading of media objects hosted on a server, onto a client. This specification defines use cases and requirements for the Download OTA version 2.

Download OTA version 2.0 is an evolution of the Download OTA version 1.0 protocol. The purpose of Download OTA version 2.0 is to add functionality that was missing from the previous version of the protocol and at the same time to guarantee backward compatibility.

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

2.2 Informative References

[DLARCH] *"Download Architecture Version 1.0", Open Mobile Alliance^{TM}, OMA-Download-Arch-v1_0, URL:http://www.openmobilealliance.org/ [OMA Download v1.0 Enabler Release]*

[DLOTA] *"Generic Content Download Over The Air Specification Version 1.0", Open Mobile Alliance^{TM}, OMA-Download-OTA-v1_0,URL: http://www.openmobilealliance.org/ [OMA Download v1.0 Enabler Release]*

[MIDP] "JSR-000118 Mobile Information Device Profile 2.0", Java Community Process, URL: http://jcp.org/aboutJava/communityprocess/final/jsr118/

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

Compound Object	Content composed of one or more downloadable media objects, which can be separately hosted by one or more download services.
Content Portal	Server component that acts as front end for other download services for the DLOTA transaction.
Download Agent	A user agent in the device responsible for downloading a *media object* described by a *download descriptor*.
Download Descriptor	Metadata about a *media object* and instructions to the *download agent* for how to download it.
Download Server	A Web server hosting *media objects* available for download using the DLOTA protocol
Media Object	A resource on a Web server that can be downloaded.

3.3 Abbreviations

CO	Compound Object
CP	Content Portal
DA	Download Agent
DD	Download Descriptor
DS	Download Server
DLOTA	Download Over-The-Air
HTTP	Hyper Text Transfer Protocol
MIDP	Mobile Information Device Profile
OMA	Open Mobile Alliance
OTA	Over-The-Air
UAProf	User Agent Profile
WAP	Wireless Application Protocol

4. Introduction (Informative)

OMA Download OTA v1.0 provides a mechanism for user-initiated download of content, such as ringtones, images, and applications. While OMA Download OTA provides much of the functionality needed to provide for a more reliable download solution than basic HTTP, other protocols such as MIDP OTA exist in the mobile industry that provide functionality beyond that of OMA Download OTA.

Download OTA v2.0 is an evolution of the Download OTA v1.0 protocol; it is not a new OTA protocol. The purpose of Download OTA v2.0 is to add functionality where needed to further converge the download protocols mentioned above without fundamentally changing the user-initiated, confirmed download paradigm introduced in the Download OTA v1.0 specifications.

Some of the key principles of the OMA Download OTA specification are as follows:

- **Execution environment neutrality**: The protocol shall support user initiated download of static content and applications to any application environment. The protocol specification may provide informative annexes describing the use of the protocol in particular environments, but shall not restrict its use implicitly or explicitly to said execution environments.

- **Content Independence**: The protocol shall be independent of content that it downloads. The protocol shall not perform certain actions based upon a particular content type being downloaded.

- **Generic mechanism**: The protocol shall address the common requirements across different existing content specific download mechanisms resulting in a generic content download protocol that reflects industry best practices.

- **Extensibility**: The protocol shall be extensible in order to address the unique requirements of each content specific environment.

- **Migration strategy**: In order for other content specific download mechanisms to be able to use the protocol, migration from existing mechanisms to the new protocol shall be addressed. The migration strategy will likely occur in other standards bodies or forums, but should be initiated by OMA.

5. Use Cases   (Informative)

The following are the high level use cases that must be satisfied by the Download OTA (DLOTA) protocol. In some cases, the use cases below are already satisfied by the DLOTA v1.0 specifications, but are included here to provide a complete view of the desired functionality.

5.1   Use Case I&E, Basic OMA Download OTA

Affected Areas				
Device	**Connectivity**	**Enabling Services**	**Applications**	**Content**

Tickmarks (X)   X   X
Additional Keywords

Table 1: Affected Areas for Basic OMA Download OTA

5.1.1   Short Description

This use case describes the basic functionality provided in DLOTA v1.0 [DLOTA]. The user gets a Download Descriptor, downloads the media object, and the Download Server is notified when the download is complete.

5.1.2   Actors

Download Server   Server component that participates in DLOTA transaction

Download Agent   Device component that participates in DLOTA transaction

User   Interacts with the Download Agent during the DLOTA transaction

5.1.2.1   Actor Specific Issues

Download Server (DS) needs to create the Download Descriptor. The DS may need device specific information (eg as provided via UAProf or HTTP request headers) to accomplish this.

5.1.2.2   Actor Specific Benefits

Download Server is optionally notified of success or failure when the download transaction completes.

Download Agent and User are able to make informed decisions before initiating the download (eg Do I have enough storage space for this media object? Do I want to pay for this media object?)

5.1.3   Pre-conditions

The Download Descriptor must exist and must be available to the Download Agent, eg by browsing to a website, pushed to the device, etc.

5.1.4   Post-conditions

The media object is available on the device.

The Download Server has optionally received an installation notification indicating the download was a success or failure.

5.1.5   Normal Flow

1.   User downloads a Download Descriptor from the Download Server using the browser.

2. The information in the Download Descriptor is analysed by the Download Agent (capability checks) and User is given a chance to initiate the media object download.

3. The media object is downloaded to the device.

4. The media object is "installed" on the device (e.g. saved in the filesystem).

5. The Download Agent notifies the Download Server that the download was a success.

6. The media object is made available to the User.

5.1.6   Alternative Flow

1a. The Download Descriptor is delivered to the User rather than downloaded, e.g. via a messaging protocol, removeable media, etc.

2a. User chooses not to initiate the download. Use case stops.

5a. The download fails or is aborted by the user. The Download Agent notifies the Download Server that the download failed with a specific error code indicating the source of the failure. Use case stops.

5b. The Download Server informs the Download Agent not to send an installation notification so this step is skipped.

5.1.7   Operational and Quality of Experience Requirements

Even if the Download Agent is not able to send the installation notification to the Download Server, the media object is still made available to the User.

5.2   Use Case I&E, Combined Delivery

Affected Areas				
Device	**Connectivity**	**Enabling Services**	**Applications**	**Content**
X		X		

Tickmarks (X)
Additional Keywords

Table 2: Affected Areas for Combined Delivery

5.2.1   Short Description

A media object and a Download Descriptor are downloaded at the same time. Because the media object and the download descriptor are both delivered together, the user is unable to initiate the download based on information in the Download Descriptor. However, this use case does support the installation notification.

5.2.2   Actors

Download Server   Server component that participates in DLOTA transaction

Download Agent   Device component that participates in DLOTA transaction

User   Interacts with the Download Agent during the DLOTA transaction

5.2.2.1   Actor Specific Issues

Download Server (DS) needs to create the Download Descriptor and package it with the media object in a multipart entity.

When the Download Descriptor and media object are downloaded together, the Download Agent will not be able to send an installation notification in the event that the download fails (because the Download Descriptor is not received).

5.2.2.2 Actor Specific Benefits

Download Server is optionally notified of success or failure when the download transaction completes.

5.2.3 Pre-conditions

The multipart entity comprising the Download Descriptor and media object must exist and must be available to the Download Agent, eg by browsing to a website, pushed to the device, etc.

5.2.4 Post-conditions

The media object is available on the device.

The Download Server has optionally received an installation notification indicating the download was a success or failure.

5.2.5 Normal Flow

1. User downloads the multipart entity from the Download Server using the browser.

2. The information in the Download Descriptor is analysed by the Download Agent (capability checks) and User is given a chance abort the installation.

3. The media object is "installed" on the device (e.g. saved in the filesystem).

4. The Download Agent notifies the Download Server that the download was a success.

5. The media object is made available to the User.

5.2.6 Alternative Flow

1a. The multipart entity is delivered to the User rather than downloaded, e.g. via a messaging protocol, removeable media, etc.

2a. The installation is aborted by the user. The Download Agent notifies the Download Server that the installation was aborted unless the Download Server informs the Download Agent not to send an installation notification. Use case stops here.

4a. The Download Server informs the Download Agent not to send an installation notification so this step is skipped.

5.2.7 Operational and Quality of Experience Requirements

Even if the Download Agent is not able to send the installation notification to the Download Server, the media object is still made available to the User.

5.3 Use Case I&E, Authentication of Trusted Entity and Content Integrity Check

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

Table 3: Affected Areas for Authentication of Trusted Entity and Content Integirity Check

5.3.1 Short Description

For some types of media objects, the Download Agent will need to authenticate that the media object is coming from a trusted Download Server. For instance, the media object being downloaded might be software that affects the functioning of

the device, it might be an application that needs special access to device or user information such as the phonebook or calendar, or it might be static content that needs to be stored in a secure or access-controlled location. In all these cases where the device can trust the Download Server, the device behaviour may be subject to the permission that is specified by the Download Server.

5.3.2   Actors

Download Server   Server component that participates in DLOTA transaction

Download Agent   Device component that participates in DLOTA transaction

User   Interacts with the Download Agent during the DLOTA transaction

5.3.2.1   Actor Specific Issues

Download Server (DS) creates the Download Descriptor. The Download Server may need device specific information (eg as provided via UAProf or HTTP request headers) to accomplish this.

The Download Agent will need to validate the Download Server credentials in order to authenticate it.

5.3.2.2   Actor Specific Benefits

The device is able to restrict the functioning of the downloaded media objects subject to the permission that is specified by the Download Server when the device can trust the Download Server.

5.3.3   Pre-conditions

The Download Descriptor must exist and must be available to the Download Agent, e.g. by browsing to a website, pushed to the device, etc.   The Download Server must attach its credentials before delivering the Download Descriptor to the Download Agent.

5.3.4   Post-conditions

The media object is available on the device.

The Download Server has optionally received an installation notification indicating the download was a success or failure.

5.3.5   Normal Flow

1.   User downloads a media object as described in the "Basic" or "Combined" use cases.

2.   Download Agent uses information in the Download Descriptor to ensure the downloaded media object was not manipulated or replaced and to ensure that the media object comes from a trusted source.

3.   The Download Agent performs specific actions, e.g. during installation, which are subject to the permission specified by the Download Server (these actions are outside the scope of the specifications).

5.3.6   Alternative Flow

2a.   The Download Agent does not trust the server or the media object appears to be tampered with. The Download Agent posts a failure installation notification to the Download Server. Use case stops.

5.3.7   Operational and Quality of Experience Requirements

No requirement identified.

5.4   Use Case I&E, Updating media objects

Affected Areas

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

Table 4: Affected Areas for Updating media object

5.4.1 Short Description

This use case describes updating a media object that is already resident on the device. The update is initiated by a user.

5.4.2 Actors

Download Server   Server component that participates in DLOTA transaction

Download Agent   Device component that participates in DLOTA transaction

User   Interacts with the Download Agent during the DLOTA transaction

5.4.2.1 Actor Specific Issues

Download Server (DS) needs to create the Download Descriptor. The DS may need device specific information (eg as provided via UAProf or HTTP request headers) to accomplish this. The media objects must have unique identifiers maintained by the DS in order to accurately identify the media object to be updated.

5.4.2.2 Actor Specific Benefits

The Download Server is able to replace media objects that are resident on the device, allowing the Download Server to keep the device up to date with the latest content (eg in a entertainment subscription service) or deliver application upgrades or patches.

5.4.3 Pre-conditions

The Download Descriptor must exist and must be available to the Download Agent, eg by browsing to a website, pushed to the device, etc.

5.4.4 Post-conditions

The media object is updated on the device.

The Download Server has optionally received an installation notification indicating the download was a success or failure.

5.4.5 Normal Flow

1. User downloads a Download Descriptor from the Download Server using the browser. The Download Agent analyses the Download Descriptor and informs the User that the media object is newer, older or the same as the version of the existing media object. The Download Agent ensures the new media object comes from the same source as the existing media object, e.g. by comparing digital signatures, domain names, etc.

2. The User chooses to initiate the media object update.

3. The media object is downloaded to the device.

4. The media object is "installed" on the device (e.g. saved in the filesystem), replacing the former media object. If the media object is an application, any persistent data associated with the application are preserved.

5. The Download Agent notifies the Download Server that the download was a success.

6. The media object is made available to the User.

5.4.6   Alternative Flow

1a.   The Download Agent asks the Download Server whether the media object that the Download Agent has is the newest version or not. The Download Server informs the Download Agent that the media object is newer, older or the same as the version of the media object that the Download Server has.

2a.   The new media object does not come from the same source as the existing media object. The Download Agent informs the user and posts a failure installation notification. Use case stops.

3a.   User chooses not to initiate the media object update. Use case stops.

3b.   Download server uses combined delivery of the Download Descriptor and media object. Step 4 is skipped.

5a.   The download fails or is aborted by the user. The Download Agent notifies the Download Server that the download failed with a specific error code indicating the source of the failure. Use case stops.

5b.   The Download Server informs the Download Agent not to send an installation notification so this step is skipped.

5.4.7   Operational and Quality of Experience Requirements

Even if the Download Agent is not able to send the installation notification to the Download Server, the media object is still made available to the User.

5.5   Use Case I&E, Removing media objects

Affected Areas				
Device	Connectivity	Enabling Services	Applications	Content
X		X		

Tickmarks (X)
Additional Keywords

Table 5: Affected Areas for Removing media objects

5.5.1   Short Description

This use case describes removing a media object that was previously downloaded.

5.5.2   Actors

Download Server   Server component that participates in DLOTA transaction

Download Agent   Device component that participates in DLOTA transaction

User   Interacts with the Download Agent during the DLOTA transaction

5.5.2.1   Actor Specific Issues

The Download Agent may prompt the user that removing a given media object may have unwanted side effects. In some cases, other installed media objects may have dependencies on the media object to be removed.

5.5.2.2   Actor Specific Benefits

Download Server is notified when media objects are removed to enable an improved user experience, e.g. in a rental or subscription service the service provider may only allow a specific number of downloaded objects to be resident on the device at a given time.

Download Agent and User are able to make informed decisions before removing the media object (eg if other media objects depend on the media object under consideration for removal).

5.5.3   Pre-conditions

The media object and Download Descriptor must be resident on the device.

5.5.4   Post-conditions

The media object and Download Descriptor are no longer resident on the device.

The Download Server has optionally received a notification indicating the removal was a success or failure.

5.5.5   Normal Flow

1. User chooses to remove media object.

2. User is informed of any dependency on this media object by other media objects, provided the dependencies are identified in the Download Descriptor.

3.   The User confirms removal and the media object is "uninstalled" on the device (e.g. removed from the filesystem).

4.   The Download Agent notifies the Download Server that the removal was a success.

5.   The media object is no longer available to the User.

5.5.6   Alternative Flow

3a.   User chooses not to confirm the removal. Use case stops (Download Server is not notified).

4a.   The removal fails. The Download Agent notifies the Download Server that the removal failed with a specific error code indicating the source of the failure. Use case stops.

4b.   The Download Server does not include a removal notification URL in the Download Descriptor so step 4 is skipped.

5.5.7   Operational and Quality of Experience Requirements

Even if the Download Agent is not able to send the removal notification to the Download Server, the media object is still removed and is no longer available to the User.

5.6   Use Case I&E, Download of Compound Object

Affected Areas				
Device	**Connectivity**	**Enabling Services**	**Applications**	**Content**
X		X		

Tickmarks (X)
Additional Keywords

Table 6: Affected Areas for Download of Compund Object

5.6.1   Short Description

DLOTA v 2.0 should provide a flexible solution that allows the download of multiple objects from different sources in the same download OTA session and at the same time to guarantee a good end-user experience. Content can be composed by several distinct media objects that need to be downloaded from different sources. A media object needs one or more rights object. Rights Object(s) and media object may be provided by different independent sources.

5.6.2   Actors

Download Server   Server component that allows the download of one or more downloadable objects during the DLOTA transaction

Download Agent	Device component that participates in DLOTA transaction
User	Interacts with the Download Agent during the DLOTA transaction
Content portal	Server component that acts as front end for other download servers for the DLOTA transaction

5.6.2.1 Actor Specific Issues

Content Portal (CP) creates the Download Descriptor for the compound object (CO). A CO is composed of one or more downloadable objects, which can be hosted by one or more download servers (DS). The user is not aware of the composite nature of the CO. The Download Agent (DA) is instructed by the Download Descriptor how and where to fetch all the objects for the CO

5.6.2.2 Actor Specific Benefits

The user perceives the download of a CO as a single download transaction. The CP and the DS can be independent entities (although some level of synchronization is required, e.g. content registration). The CP does not need to store, maintain and aggregate the different objects that form a CO.

5.6.3 Pre-conditions

The CP knows which downloadable objects (part of a single CO) are hosted by each of the DS. A Download Descriptor for the CO exists and it is hosted by the CP. The CP provides an interface, e.g. WEB / WAP, thus to allow the discovery of the CO to be downloaded. The DA is able to process the Download Descriptor as provided by the CP.

5.6.4 Post-conditions

The CO is available in all of its parts on the device.

The CP has optionally received an installation notification indicating the download was a success or a failure.

5.6.5 Normal Flow

1. User downloads a CO from a CP

2. DA uses information in the Download Descriptor to fetch the several objects that compose the CO.

3. The DA fetches each single object of the CO separately. The DA performs specific actions, e.g. during the installation phase, based upon the nature of the Compound Object and its components. Such actions are outside the scope of this specification.

5.6.6 Alternative Flow

3a.   The DA is not able to complete the download transaction of one of the objects of the CO. In this case the DA aborts the whole OTA transaction of the CO and discards all the previously downloaded objects related to the CO being downloaded.

5.6.7 Operational and Quality of Experience Requirements

No requirement identified.

5.7 Use Case I&E, Download of multiple objects

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

Table 7: Affected Areas for Donwload of multiple objects

5.7.1   Short Description

DLOTA v 2.0 should provide a flexible solution that allows the download of multiple objects from different sources in the same download OTA session and at the same time to guarantee a good end-user experience. Content can be composed by several distinct media objects that need to be downloaded from different sources. This is regarded as a "shopping-cart use case", where a user selects many pieces of content to be downloaded.

5.7.2   Actors

Download Server	Server component that allows the download of one or more downloadable objects during the DLOTA transaction
Download Agent	Device component that participates in DLOTA transaction
User	Interacts with the Download Agent during the DLOTA transaction
Content portal	Server component that acts as front end for other download servers for the DLOTA transaction

5.7.2.1   Actor Specific Issues

Content Portal (CP) creates the Download Descriptor for the download of multiple downloadable objects from different download servers (DS). The user is aware of the number of objects that the DA downloads.

Multiple objects can be also multiple Compound Objects (CO) (as described in the previous use case). COs must be treated as single objects and the DA must hide the composite nature of a CO from the user.

5.7.2.2   Actor Specific Benefits

The user is aware of the number and type of the objects that are being downloaded by the DA. The CP does not need to store, maintain and aggregate all the different media objects. The CP and the DS' can be independent entities.

5.7.3   Pre-conditions

The CP knows which downloadable objects (as part of the multiple objects bundle) are hosted by each of the DS. The CP provides an interface, i.e. WEB / WAP, thus to allow the discovery of the media objects.

5.7.4   Post-conditions

The objects are available on the device.

Each DS has optionally received an installation notification relative to the downloadable object it hosts; the install notification indicates the download was a success or a failure.

The CP has optionally received an install notification about the success or failure relative to the overall download transaction.

5.7.5   Normal Flow

1. User selects several objects to be downloaded.

2. CP creates the Download Descriptor that enables the download of multiple objects (all the objects the user has chosen).

3. The DA fetches each single object separately. The Download Agent performs specific actions, e.g. during the installation phase, based upon the type of the object. Such actions are outside the scope of this specification.

5.7.6   Alternative Flow

Not identified.

5.7.7 Operational and Quality of Experience Requirements

The success or failure of the download operation relative to one object does not have impact over the download of the remaining-to-download and previously-downloaded objects.

5.8 Use Case I&E, Download Timing Reservation

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

Table 8: Affected Areas for Download Timing Reservation

5.8.1 Short Description

DLOTA v 2.0 should provide a flexible solution that enables users to make reservations for downloading of media objects and performs downloading automatically afterward.

Usually, the communication during early morning and late at night cost less on the Users because network traffic during these hours is typically lighter than that of daytime. Download reservation allows the Users and the Network operators to use network traffic effectively, and is beneficial for both.

5.8.2 Actors

Download Server   Server component that participates in DLOTA transaction

Download Agent   Device component that participates in DLOTA transaction

User   Interacts with the Download Agent during the DLOTA transaction

5.8.2.1 Actor Specific Issues

The User may request downloading reservation to the Download Server.

The Download Server has capability of time management functionality and inform the timing information to the Download Agent.

The Download Agent initiates downloading automatically at the reserved starting time.

5.8.2.2 Actor Specific Benefits

The User can download media objects when the communication is less expensive and/or the network is less congested.

The User can consume the media objects without waiting on site for downloading and installing which may take a while.

The Download Server can decentralize the access to the network from a large number of the Download Agents.

The Download Agent automatically downloads Download Descriptor and/or Media Objects from Download Server without User initiation in appropriate timing.

5.8.3 Pre-conditions

The Download Descriptor must exist and must be available to the Download Agent.

5.8.4 Post-conditions

The media object is automatically downloaded onto the device.

The Download Server has optionally received a notification indicating the download of media objects was a success or failure.

5.8.5   Normal Flow

1. The Download Agent requests download reservation to the Download Server. And the Download Server gives a list of candidate time for downloading.

2. The User may select the candidate time and the Download Agent sets the time for automatic downloading. And the Download Agent may notify the selected time to the Download Server

3. The Download Agent initiates downloading automatically when the reserved time passes.

4. The Download Agent notifies the Download Server that the download was success.

5. The Media Object is made available to the User.

5.8.6   Alternative Flow

1a   The Download Server pushes a list of candidate time for downloading.

2a   The Download Agent sets the time for automatic downloading.

5.8.7   Operational and Quality of Experience Requirements

No requirement identified.

5.9   Use Case I&E, Server Initiated Automatic Download

Affected Areas				
Device	**Connectivity**	**Enabling Services**	**Applications**	**Content**

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

Table 9: Affected Areas for Server Initated Automatic Download

5.9.1   Short Description

This use case describes DLOTA v2.0 automatic download. The Download Server pushes Download Descriptor to the Download Agent. When the Download Agent receives the Download Descriptor, it checks Download Descriptor and automatically downloads the Media Object. This use case may be used on contents subscription scenario.

5.9.2   Actors

Download Server   Server component that participates in DLOTA transaction

Download Agent   Device component that participates in DLOTA transaction

Push Gateway/Proxy   Gateway Component that participates in DLOTA transaction

User   Interacts with the Download Agent during the DLOTA transaction

5.9.2.1   Actor Specific Issues

The Download Server should have a capability to push the Download Descriptor through Push Gateway/Proxy. The Download Agent also should receive pushed Download Descriptor and automatically fetch the Media Object.

5.9.2.2   Actor Specific Benefits

The Download Agent automatically downloads the contents from the Download Server without User initiation.

The User should be informed the result of the DLOTA transaction.

5.9.3   Pre-conditions

The Download Descriptor and Media Object must exist and available to the Download Agent.

5.9.4   Post-conditions

The Media Object is available on the device. The Download Server has optionally received an installation notification indicating the download was a success or failure.

5.9.5   Normal Flow

1. The Download Server pushes the Download Descriptor through Push Gateway/Proxy to the Download Agent.

2. The Download Agent checks the Download Descriptor and automatically downloads the Media Object to the device.

5.9.6   Alternative Flow

2a.   If the Media Object is not available on Download Server, Download Agents aborts downloading.

2b.   The device aborts the transaction because of lack of capability.

5.9.7   Operational and Quality of Experience Requirements

Useris notified when the DLOTA transaction is failed.

5.10 Use Case I&E, Pre-downloading of Media Objects

Affected Areas				
Device	**Connectivity**	**Enabling Services**	**Applications**	**Content**
X		X		

Tickmarks (X)
Additional Keywords

Table 10: Affected Areas for Pre-downloading of Media Objects

5.10.1   Short Description

The Download Agent downloads a number of media objects for later use by using a network bearer that is economical and/or has an adequate bandwidth. Afterward, the User decides to consume some of the media objects that have already been downloaded to the device.

To let the Download Server know the media objects are correctly downloaded or not, the Download Agent may notify the Download Server completion of downloading. The Download Agent may also notify the Download Server what media objects are selected by the User and whether each of the selected media objects is installed correctly or not.

5.10.2   Actors

Download Server   Server component that participates in DLOTA transaction

Download Agent   Device component that participates in DLOTA transaction

User   Interacts with the Download Agent during the DLOTA transaction

5.10.2.1   Actor Specific Issues

The Download Agent notifies completion of downloading the media objects to the Download Server.

5.10.2.2   Actor Specific Benefits

When the User decides to consume the media objects, the User can do so immediately. The User needs not to wait downloading to be completed since the media objects are already downloaded onto the Device in advance.

The Download Server can know what kinds of and how many media objects are downloaded to the Download Agent, and what kinds of and how many installations are actually completed.

5.10.3   Pre-conditions

The Download Descriptor must exist and must be available to the Download Agent, e.g. by browsing to a website, pushed to the device, etc.

5.10.4   Post-conditions

The Download Server has optionally received a notification indicating the download was a success or failure.

The Download Server has optionally received a notification indicating the installation was a success or failure.

5.10.5   Normal Flow

1.   The Download Agent downloads media objects from the Download Server.

2.   The Download Agent notifies the Download Server that the download was completed.

3.   The User decides to install one of the media objects that have already been downloaded to the Download Agent.

4.   The Download Agent sends the install notification of the installed media object to the Download Server.

5.   The Media Object is made available to the User.

5.10.6   Alternative Flow

Not identified.

5.10.7   Operational and Quality of Experience Requirements

No requirement identified.

5.11   Use Case I&E, Download of Chunked Media Object

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

Table 11: Affected Areas forDownload of Chanked Media Object

5.11.1   Short Description

DLOTA v 2.0 should support downloading of large media objects (e.g. 1Mbytes～) that are divided into multiple chunks of data, in order to deal with a maximum transfer size that may be imposed by the underlying network.

5.11.2   Actors

Download Server   Server component that participates in DLOTA transaction

Download Agent   Device component that participates in DLOTA transaction

User   Interacts with the Download Agent during the DLOTA transaction

5.11.2.1   Actor Specific Issues

Download Server needs to divide the media object into multiple chunks of data and allows the download agent to fetch them separately.

5.11.2.2   Actor Specific Benefits

The Download Agent and the User are able to obtain media objects that exceed the maximum transfer size as a result.

5.11.3   Pre-conditions

The capability of downloading chunks of data separately may enable other functionalities i.e. handling of interrupted download transactions.

The Download Descriptor must exist and must be available to the Download Agent, e.g. by browsing to a website, pushed to the device, etc.

The download descriptor includes the information of chunked data (e.g. maximum size that can be transferred by one request).

5.11.4   Post-conditions

The media object is available on the device.

The Download Server has optionally received a notification indicating the download of media objects was a success or failure.

5.11.5   Normal Flow

1.   The Download Agent receives the Download Descriptor from the download server.

2.   The Download Agent starts downloading each chunked media object i.e. issuing several requests..

5.11.6   Alternative Flow

Not identified.

5.11.7   Operational and Quality of Experience Requirements

No requirement identified.

5.12   Use Case I&E, Support for resumable download session, PAUSE and RESUME functionality

Affected Areas				
Device	**Connectivity**	**Enabling Services**	**Applications**	**Content**
X		X	X	

Tickmarks (X)
Additional Keywords

Table 12: Affected Areas for Support for resumable download session, PAUSE and RESUME functionality

5.12.1   Short Description

With the media objects becoming larger in size, the time needed to download them increase as well as it increases the probability for the OTA transaction to be interrupted at some point before completion. Temporary lack of coverage, lack of resources within the device or some other event may occur with the result of breaking the download. Therefore the DLOTA 2.0 should support a mechanism to pause and then to resume a download session..

5.12.2   Actors

Download Server   Server component that participates in DLOTA transaction

Download Agent   Device component that participates in DLOTA transaction

User   Interacts with the Download Agent during the DLOTA transaction

5.12.2.1   Actor Specific Issues

Download server provides the download descriptor and the media object to the download agent.

5.12.2.2   Actor Specific Benefits

The user is able to continue a download session form the point it was interrupted. The user may also be able to pause the download transaction and resume it at a later time when more convenient for him/her.

5.12.3   Pre-conditions

The download server allows the continuation of an interrupted download session.

The transport protocol allows the partial download of a media object, i.e. HTTP byte-range

The download agent supports resume of a download transaction from the point it was interrupted.

The download agent is capable of informing the user about any interrupted download transaction.

5.12.4   Post-conditions

The media object is available on the device.

5.12.5   Normal Flow (PAUSE)

1.   The download agent downloads the media object

2.   The user decides to "pause" the download transaction

3.   The download agent pauses the download transaction

5.12.6   Normal Flow (RESUME)

1.   The user resumes the download transaction that was previously interrupted

2.   The download agent resumes the download transaction of the media object form the exact point where it was interrupted.

5.12.7   Alternative Flow

Not identified.

5.12.8   Operational and Quality of Experience Requirements

No requirement identified.

5.13 Use Case I&E, Control of User Confirmation Prompt

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

Table 13: Affected Areas for Control of User Confirmation Promt

5.13.1 Short Description

In order to better support the use cases where the download of a media object occurs without the user being aware of it, the DLOTA 2.0 should support a mechanism to control the user confirmation prompt. Moreover, in a pull scenario, where the content is discovered and downloaded during a browsing session, the user confirmation prompt may represent an unnecessary step. In the push scenario, where the content provider pushes the download descriptor to a device, security issues must be considered. Removing the user confirmation prompt may allow malicious content providers to push malicious content to a target device, therefore a level of trust between the content provider and the user's device must exist prior the download of a media object could occur without asking for the user's confirmation.

5.13.2 Actors

Download Server   Server component that participates in DLOTA transaction

Download Agent   Device component that participates in DLOTA transaction

User   Interacts with the Download Agent during the DLOTA transaction

5.13.2.1 Actor Specific Issues

Download server provides the download descriptor and the media object to the download agent.

5.13.2.2 Actor Specific Benefits

The user is able to get the media object without extra confirmation steps.

5.13.3 Pre-conditions

The Download Descriptor must exist and must be available to the Download Agent, e.g. by browsing to a website, pushed to the device, etc. The Download Descriptor contains instructions for the Download Agent whether or not to prompt the user for confirmation of the download transaction.

For the sake of the use case, the pre-condition assumes that the Download Descriptor instructs the download agent NO to prompt the user for confirmation of the download transaction.

5.13.4 Post-conditions

The media object is available on the device.

5.13.5 Normal Flow

1. The download agent receives the download descriptor.

2. The download agent performs all the necessary device capability checking.

3. The download agent verifies that the download server, where the media object is downloaded from, belongs to a trusted web/wap domain.

4. The download agent downloads the media object without prompting the user for confirmation of the download transaction.

5. The download agent concludes the DLOTA transaction as instructed by the download descriptor, i.e. post install notification.

5.13.6 Alternative Flow

4a. The download agent prompts the user for confirmation before proceeding with the download of the media object.

5.13.7 Operational and Quality of Experience Requirements

No requirement identified.

5.14 Use Case I&E, Progressive download of Media Objects

Affected Areas				
Device	**Connectivity**	**Enabling Services**	**Applications**	**Content**
X		X	X	

Tickmarks (X)
Additional Keywords

Table 14: Affected Areas for Progressive download of Media Objects

5.14.1 Short Description

In order to improve the user experience DLOTA 2.0 should support the reproduction of Media Objects when they are being still downloaded. The term "progressive download" is intended to describe this kind of functionality. If progressive download is allowed and supported by the device, the Download Agent can start to rendering the content while the download is in progress.. The downloading process continues without any interruption and at the end, the Media Object remains complete in the Terminal, this is, the User can use it whenever he wants.

5.14.2 Actors

Download Server   Server component that participates in DLOTA transaction
Download Agent   Device component that participates in DLOTA transaction
Rendering Application Application that is capable of rendering the Media Object that is being downloaded
User   Interacts with the Download Agent during the DLOTA transaction

5.14.2.1 Actor Specific Issues

Download Server provides the Download Descriptor and the Media Object to the Download Agent.

Download Agent is able to download a Media Object.

Download Agent is able to communicate with the Rendering Application thus to allow the rendering the media object while the download is in progress.

5.14.2.2 Actor Specific Benefits

The User is able to begin to use the Media Object he is receiving even when the downloading session has not ended, this is, without waiting for the full download to end.

The Download Server is informed about the progression of the download process.

5.14.3 Pre-conditions

The Download Descriptor must exist and must be available to the Download Agent, e.g. by browsing to a website, pushed to the device, etc. The Download Descriptor contains instructions for the Download Agent informing it whether progressive download can be enabled.

5.14.4   Post-conditions

The Media Object is available on the device.

5.14.5   Normal Flow

1. The Download Agent receives the Download Descriptor.

2. The Download Agent performs all the necessary checkings (device capability, reproduction of the media is allowed, etc.).

3. The Download Agent begins the downloading of the Media Object.

4. Progressive download is allowed so when an enough amount of data of the Media Object has been received the Download Agent gives to the rendering application the possibility to start the rendering of the content.

5. Download process continues normally without interruption.

6. When the downloading of the Media Object is completed the Download Agent concludes the DLOTA transaction as instructed by the Download Descriptor.

7. The Media Object is available on the device.

5.14.6   Alternative Flow

2a. The device is not able to use correctly the content-type of the Media Object. The Download Agent informs the User and posts a failure installation notification. Use case stops.

3a. User chooses not to initiate the Media Object downloading. Use case stops.

4a   Progressive download is not allowed or not supported or not available for the Media Object being downloaded so nothing but downloading information (progress, time remaining, received data, etc.) is showed. The download process continues normally.

6a. The download fails or is aborted by the User. The Download Agent notifies the Download Server that the download failed with a specific error code indicating the source of the failure. Use case stops.

5.14.7   Operational and Quality of Experience Requirements

No requirement identified.

5.15   Use Case I&E, Download OTA over broadcast protocols

Affected Areas				
Device	**Connectivity**	**Enabling Services**	**Applications**	**Content**
X	X	X		

Tickmarks (X)
Additional Keywords

Table 15: Affected Areas for Download OTA over broadcast protocols

5.15.1   Short Description

In this use case the download of a media object occurs through a broadcast bearer. The OMA DLOTA download descriptor (DD) is used to carry the necessary information for starting the broadcast session. This information can be carried within the DD itself or the DD can be used to download a session descriptor file. Regardless of the mechanism, the DLOTA session and the relative transaction outcome will be relative to the download of the media object itself and not of the DD or any other session descriptor.

5.15.2 Actors

Broadcast Server   Server component that participates in DLOTA transaction by providing media objects via a broadcast session

Download server   Server component that participates in the DLOTA transaction

Download Agent   Device component that participates in DLOTA transaction

User   Interacts with the Download Agent during the DLOTA transaction

5.15.2.1   Actor Specific Issues

The broadcast server provides the media object.

The download server is responsible for handling the install-notification.

5.15.2.2   Actor Specific Benefits

The user is able to download content via a broadcast session and the experience will be the same as downloading the content over any DLOTA session.

5.15.3 Pre-conditions

A DD is available on the Download server.

The Download Agent is able to handle a broadcasting session.

5.15.4 Post-conditions

The media object is available on the device.

5.15.5 Normal Flow

1.   A DD is downloaded from a presentation server into a client and passed to the Download Agent for further processing.

2.   The Download Agent starts the broadcast session according to the instructions provided within the DD.

3.   The media object(s) is downloaded over the broadcast session.

4.   (optionally) the install notification is sent back to the download server.

5.15.6 Alternative Flow

1.   A DD is downloaded from a Donwload server into a client and passed to the Download Agent for further processing.

2.   The Download Agent downloads a session descriptor file whose URI is indicated in the DD.

3.   The session descriptor file is downloaded and processed, and the broadcast session is then started..

4.   The media object(s) is downloaded over the broadcast session.

5.   (optionally) the install notification is sent back to the download server.

5.15.7 Operational and Quality of Experience Requirements

No requirement identified.

5.16 Use Case I&E, Download from Multiple Servers

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

Table 16: Affected Areas for Download from Multiple Servers

5.16.1 Short Description

User chooses content from Content Portal. Download Agent downloads a Download Descriptor from Content Portal, where the Download Descriptor may include multiple sources for content object(s). Multiple copies of the object(s) may be located on more than one Download Server. The Download Agent uses information in the Download Descriptor to fetch the object(s) from multiple Download Servers simultaneously. The Download Agent reconstructs content object(s) as soon as the Download Agent receives data from a subset of the Download Servers.

5.16.2 Actors

Content Portal	Server component(s) that allow the discovery of content and creates the download descriptor (DD).
Download Server	Server component(s) that allow the download of content during the DLOTA transaction
Download Agent	Device component that participates in DLOTA transaction
User	Interacts with the Download Agent during the DLOTA transaction

5.16.2.1 Actor Specific Issues

Content Portal (CP) creates the Download Descriptor for the content object (CO). A CO is composed of one or more downloadable objects. Copies of the objects can be hosted by one or more Download Servers (DS). The Download Agent (DA) is instructed by the Download Descriptor how and where to fetch all the objects for the CO, with consideration if multiple Download Servers and multiple copies are available. The CP may store, maintain, and aggregate the source(s) of available objects. The Download Agent can contact multiple Download Servers simultaneously to fetch the object(s). The Download Agent can reconstruct content object(s) as soon as the Download Agent receives data from a subset of the Download Servers.

5.16.2.2 Actor Specific Benefits

The end user experience is improved because client can receive content independent of server bandwidth rates or server availability. The CP and the DS can be independent entities (although some level of synchronization is required, e.g. content registration).

5.16.3 Pre-conditions

The CP knows which DS servers host the downloadable objects. A Download Descriptor for the objects exists and it is hosted by the CP. The CP provides an interface, e.g. WEB / WAP, thus to locate available content to be downloaded. The DA is able to process the Download Descriptor as provided by the CP. The Download Agent can contact multiple Download Servers simultaneously to fetch the object(s). The Download Agent can reconstruct content object(s) as soon as the Download Agent receives data from a subset of the Download Servers.

5.16.4 Post-conditions

The downloaded objects are available for consumption on the device.

The CP has optionally received an installation notification indicating the download was a success or a failure.

5.16.5 Normal Flow

1. User chooses content from Content Portal (CP).

2. CP creates the Download Descriptor (DD) for content objects, copies of which possibly reside on multiple Download Servers (DS).

3. Download Agent (DA) downloads DD from CP, where DD may include multiple DS for the object(s).

4. DA uses information in DD to fetch the object(s) from multiple DS simultaneously.

5. DA reconstructs content object(s) as soon as DA receives data from a subset of the Download Servers.

6. The DA performs specific actions, e.g. during the installation phase, based upon the nature of the object(s). Such actions are outside the scope of this specification.

5.16.6   Alternative Flow

This use case may be applied also to use cases 5.6 and 5.7.

5.16.7   Operational and Quality of Experience Requirements

No requirement identified.

5.17 Open Issues

No open issue is identified.

6. Requirements   (Normative)

6.1   High-Level Functional Requirements

Ref	Use Case Title(s)	Requirements
GR-1	Basic OMA Download OTA, Combined Delivery	The DLOTA SHALL support download models with different levels of overhead.
GR-1a	Combined Delivery	1-step download: media object download without additional request-reply interactions for content negotiation and application level transaction verification.
GR-1b	Basic OMA Download OTA	2-step download: media object download without additional request-reply interactions for content negotiation, but with separate and explicit application level transaction verification.
GR-1c	Basic OMA Download OTA	2-step download: media object download with additional request-reply interactions for content negotiation, but without explicit application level transaction verification.
GR-1d	Basic OMA Download OTA	3-step download: media object download with additional request-reply interactions for content negotiation and application level transaction verification.
GR-2	Basic OMA Download OTA	The DLOTA SHALL support downloading media objects of any media type.
GR-3	Basic OMA Download OTA	The DLOTA SHALL support downloading media objects of any media size.
GR-3a	Download of Chunked Media Object	The DLOTA SHALL support downloading media objects that are divided into multiple chunked data.
GR-4	Basic OMA Download OTA, Removing media objects Pre-downloading of Media Objects	The DLOTA SHALL support bearer agnostic delivery mechanisms that include facilities for various application level notification function.
GR-4a	Basic OMA Download OTA	It SHALL be possible to notify the completion of downloading.
GR-4b	Pre-downloading of Media Objects	It SHALL be possible to notify the completion of installation.
GR-4c	Removing media objects	It SHALL be possible to notify that the removal of the Media Object was a success.
GR-5	Basic OMA Download OTA	The DLOTA Download Descriptor SHALL be extensible.
GR-5a	Basic OMA Download OTA	It SHALL be possible to add additional metadata that describe the characteristics of the media object to be downloaded.
GR-5b	Basic OMA	It SHALL be possible to add additional metadata that control the processing of the

	Download OTA	content object by a content handler.
GR-6	Basic OMA Download OTA	The DLOTA SHALL support direct transfer of binary content (e.g. avoid Base64 encoding) to reduce overhead.
GR-7	Download Timing Reservation, Server Initiated Automatic Download	The DLOTA SHALL support a mechanism that allows the download of a media object according to a predefined download reservation time.
GR-8	Basic OMA Download OTA	The DLOTA SHALL support a mechanism that allows the Download Descriptor to be received over push from the Download Server.
GR-9	Support for resumable download session, PAUSE and RESUME functionality	The DLOTA SHALL support a mechanism that allows the user to pause an on-going download session.
GR-10	Support for resumable download session, PAUSE and RESUME functionality	The DLOTA SHALL support a mechanism that allows the user to resume a previsouly paused or interrupted download session.
GR-11	Support for resumable download session, PAUSE and RESUME functionality	The DLOTA SHALL support a mechanism that allows the user to cancel an on-going download session.
GR-12	Download of Compound Object	The DLOTA SHALL allow the download of compound object.
GR-13	Download of Compound Object, Download of multiple objects	The DLOTA SHALL allow the download of multiple media objects and multiple compound objects.
GR-14	Control of User Confirmation Prompt	The DLOTA SHALL support a mechanism that allows the content provider to instruct the download agent whether or not to prompt the user for confirmation.
GR-15	Authentication of Trusted Entity and Content Integrity Check	The DLOTA SHALL support a mechanism that allows the content provider to recognize a content provider as a trusted one.
GR-16	Progressive download of Media Objects	The DLOTA SHALL enable progressive download, that is, the contents can be used during the downloading process.
GR-17	Download OTA over broadcast protocols	The DLOTA SHALL support the download of media objects over broadcast protocols (e.g. FLUTE).
GR-18	Download OTA over broadcast protocols	It SHALL be possible to avoid congestion caused by many simultaneous installation notifications sent from terminals that receive DLOTA content at the same time (for example over broadcast or multicast transport protocols).

GR-19	Download from Multiple Servers	The DLOTA Download Descriptor SHALL be extensible. It SHALL be possible to add additional multiple server identifiers to download descriptors.
GR-20	Updating media objects	The DLOTA SHALL support updating a media object that is already resident on the device.

6.1.1 Security

Ref	Use Case Title(s)	Requirements
SEC-1	Basic OMA Download OTA	The DLOTA SHALL support user authentication to secure Media Object (example: HTTP Basic Authentication).
SEC-2	Authentication of Trusted Entity and Content Integrity Check	The DLOTA SHALL support server authentication to secure Media Object.
SEC-3	Authentication of Trusted Entity and Content Integrity Check	The DLOTA SHALL support integrity protection of the Download Descriptor.
SEC-4	Authentication of Trusted Entity and Content Integrity Check	The DLOTA SHALL support integrity protection of the Media Object.

6.1.2 Charging

Ref	Use Case Title(s)	Requirements
CRG-1	Basic OMA Download OTA	The DLOTA SHALL enable payment transactions to be performed.
CRG-2	Basic OMA Download OTA	The DLOTA SHALL enable charging models such as pay per content, subscription for content and free content.
CRG-3	Download from Multiple Servers	The DLOTA SHALL support different owners of content as well as different billing points

6.1.3 Administration and Configuration

Ref	Use Case Title(s)	Requirements
ADM-1	Basic OMA Download OTA	In case the DLOTA protocol needs information that has to be defined a'priori: Provisioning of information for the Download Agent SHALL be possible without user interaction.
ADM-1a	Basic OMA Download OTA	Existing provisioning mechanisms SHOULD be leveraged for this purpose.

6.1.4   Usability

Ref	Use Case Title(s)	Requirements
USE-1	Basic OMA Download OTA	The DLOTA SHALL enable consistent user experiences for downloading of all types of media: e.g. games, melodies, and pictures
USE-2	Basic OMA Download OTA	The DLOTA SHALL favour the User, meaning even though the installation notification cannot be sent the media object must still be released to the User
USE-3	Basic OMA Download OTA	The DLOTA SHALL allow for separation of content presentation and commercial transaction management.

6.1.5   Interoperability

Ref	Use Case Title(s)	Requirements
IOP-1	Basic OMA Download OTA, Download OTA over broadcast protocols	The DLOTA SHOULD be compatible with other content delivery schemes in the marketplace today. The DLOTA specifications may include appendices describing interaction with and application to other delivery schemes.

6.1.6   Privacy

No requirement identified.

6.2   **Overall System Requirements**

Ref	Use Case Title(s)	Requirements
SYS-1	Basic OMA Download OTA	It SHALL be possible to deploy the DLOTA protocol even if the system includes a WAP Proxy.

6.3   **System Elements**

No requirement identified.

6.3.1   System Element A

No requirement identified.

6.3.1.1   **Interfaces to System Element X**

No requirement identified.

6.3.1.2   **Interfaces to System Element Y**

No requirement identified.

6.3.2   Network interfaces

No requirement identified.

Appendix A.   Change History (Informative)

A.1   Approved Version History

Reference	Date	Description
OMA-RD-DLOTA-V2_0-20110329-A	29 Mar 2011	Status changed to Approved by TP: OMA-TP-2011-0100-INP_Download_OTA_V2_0_ERP_for_Final_Approval