RFC-106 MEG Deployment Management Object

Confidential, Draft

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Abstract

10 point Arial Centered.

Put information about the purpose of the document and the information that it contains here. This text should not extend beyond this front page. If it does, revise the abstract.

0 Document Information

0.1 Table of Contents

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0.2 Terminology and Document Conventions

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY" and "OPTIONAL" in this document are to be interpreted as described in [1].

`Source code is shown in this typeface.`

0.3 Revision History

The last named individual in this history is currently responsible for this document.

Revision	Date	Comments
Initial	03. 16. 2005	Initial proposal. Magdolna Gerendai, Nokia, magdolna.gerendai@nokia.com
0.2	03.18.2005	Added dynamic node under Download node, Generic Alert syntax and semantic, clarifications in the Exec commands semantic, some editorial changes Magdolna Gerendai, Nokia, magdolna.gerendai@nokia.com
0.21	03.23. 2005	Corrections based on telcon discussion. Andre Kruetzfeldt, Sun, Andre.Kruetzfeldt@Sun.COM
0.3	04.05.2005	MO tree and parameter change, status codes. Magdolna Gerendai, Nokia, magdolna.gerendai@nokia.com
0.4	04.08.2005	Execution status update, Generic alert parameters update, editorial changes. Magdolna Gerendai, Nokia, magdolna.gerendai@nokia.com

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1 Introduction

This document describes management object used in a Deployment Package management process that is based on the OMA DM v 1.2 protocol. It defines the Deployment Management Object and the protocol between the client and server to manage the download and deployment of DPs.

2 Application Domain

This section should be copied from the appropriate RFP(s). It is repeated here so it can be extended while the RFC authors learn more subtle details.

3 Problem Description

This section should be copied from the appropriate RFP(s). It is repeated here so it can be extended while the RFC authors learn more subtle details.

4 Requirements

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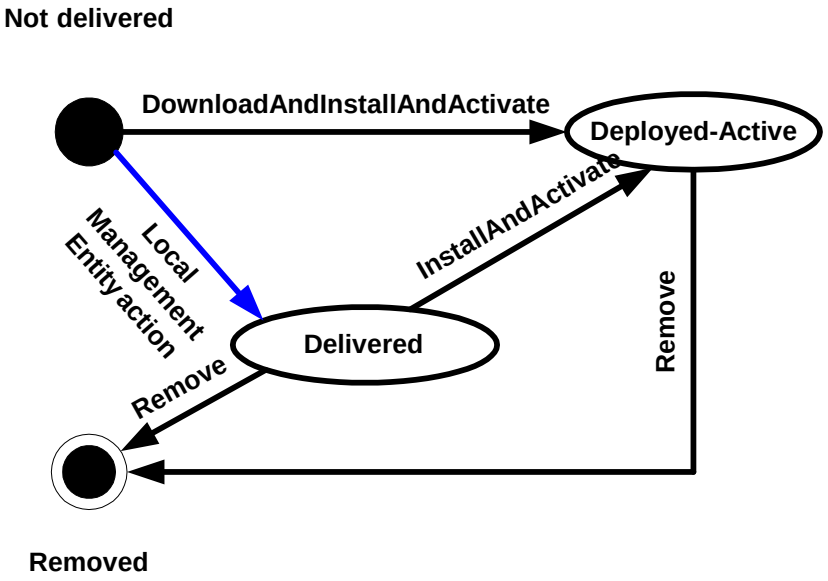
5 Technical Solution

5.1 Deployment Package State on the device

There are two possible States of a Deployment Package on the device known by the DM framework: Delivered and Deployed-Active:

- In Delivered State the Deployment Package has been delivered into the device, but not deployed and it is stored in a storage accessible by DM Framework. Likely it's delivered via another technology than OMA DM to the device (e.g. Bluetooth, MMS, e-mail, etc.) and a Local Management Entity inserted it into the tree via the DMT API
- In Deployed-Active state the DP has been installed into the OSGi runtime system and services or resources it embodies are accessible to other entities or resources (incl. end-user).



5.1.1 Operations Primitives

Operation primitives are used to transfer Deployment Components between different states:

Primitive	Description
Remove	This primitive is used to remove Deployment Package from any state.
InstallAndActivate	This primitive is used to move Deployment Package from Delivered state to Deployed-Active state.

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5.1.2 Download related primitive

Download primitive is used to enable the client to download the Deployment Package into Deployed-Active state directly with one command to enable streaming like installation of a Deployment Package.

Primitive	Description
DownloadAndInstallAndActivate	This primitive is used to download Deployment Package into Deployed-Active state.

5.1.3 Deployment Management Object scope

This Management Object covers the delivery and management of Deployment Packages in the client.
This specification doesn't take stance on how possible dependency management between deployment components is done. Mapping to the DM tree and displaying of Deployment Packages that are delivered to the device outside of this management framework are not handled in this specification.
Also timeouts and other triggers for operation commands are implementation specific decisions.

5.2 Deployment Management Object

The management object is statically created under the OSGi node in the DM tree.

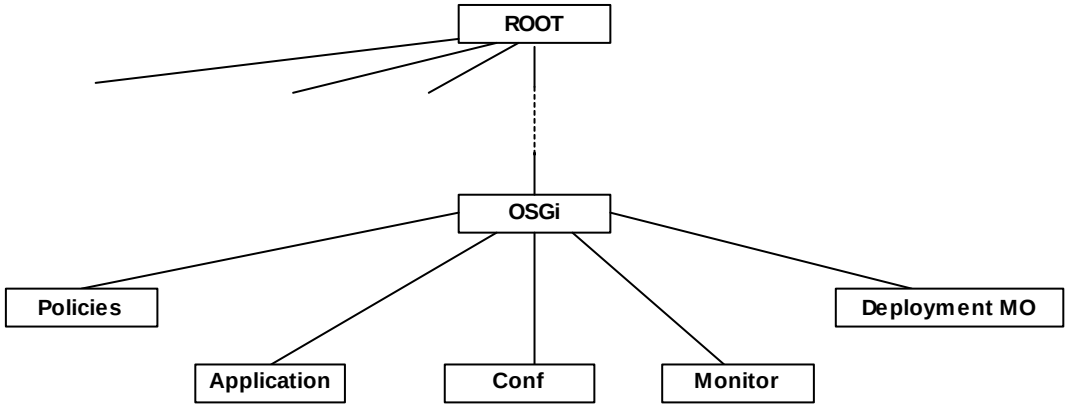
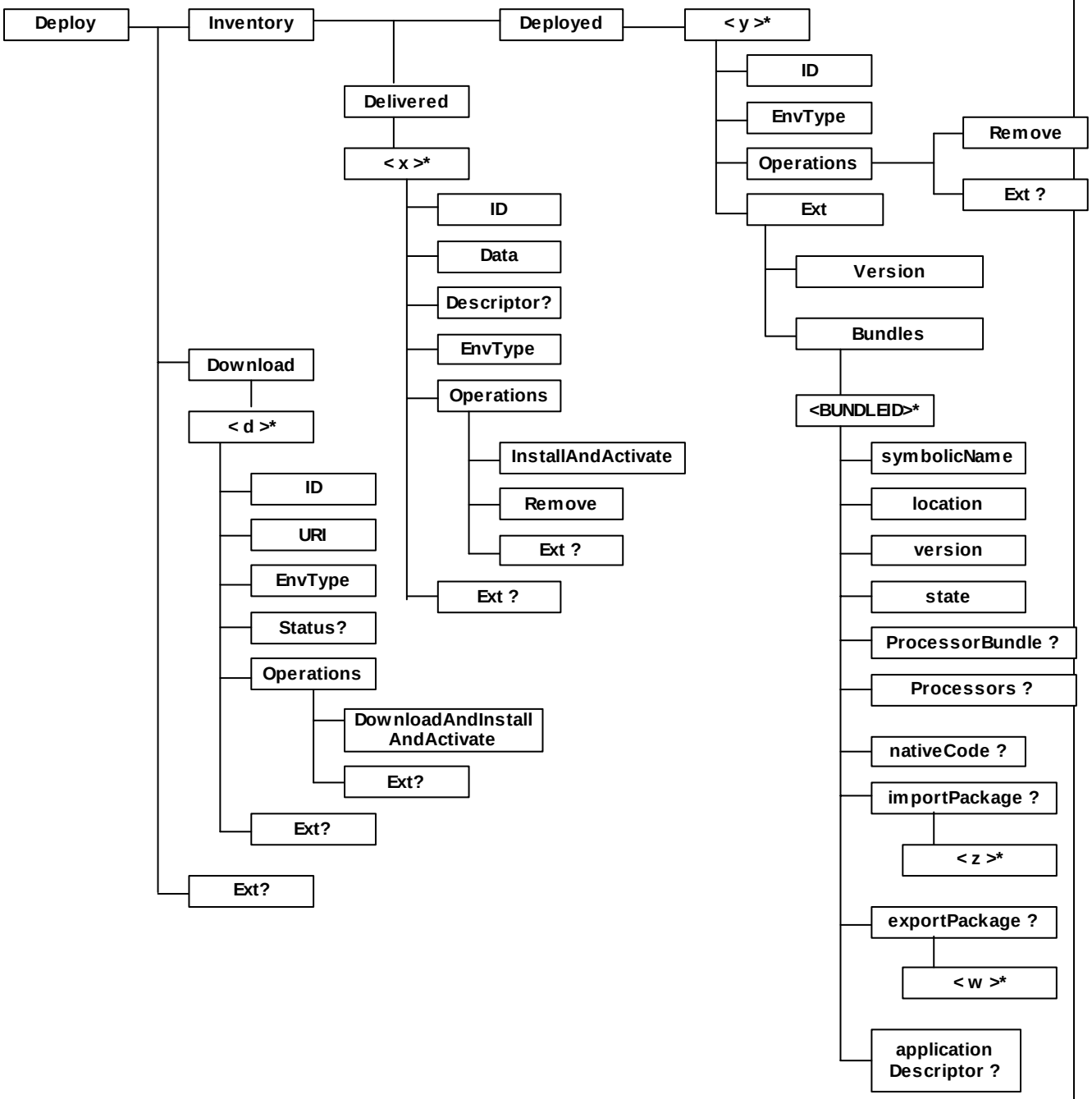


Figure 2. Deployment Management Object in the device tree

Management Object identifier: org.osgi./1.0/DeploymentManagementObject
Protocol Compatibility: This object is compatible with OMA Device Management protocol specifications, version 1.2 and upward.

5.2.1 Deployment Management Object internal structure



5.2.2

5.2.2 Deployment Management Object Parameters

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The [OSGi-root] notation represents the location of the OSGi interior node in the DM tree. The manufacturers or vendors define its actual path from the DM tree root on the device.

5.2.2.1 Node [OSGi-root]/Deploy

Parameters of the Deployment Management Object are assembled under this interior node.

AccessType: Get

Format: node

Occurrence: One

Scope: Permanent

5.2.2.2 Node [OSGi-root]/Deploy/Download

This is the parent node for the Download operations.

AccessType: Get

Format: node

Occurrence: One

Scope: Permanent

5.2.2.3 Node [OSGi-root]/Deploy/Download/<d>

This dynamically created node is the parent node of Download parameters for a Deployment Package.

AccessType: Get, Add, Delete

Format: node

Occurrence: ZeroOrMore

Scope: Dynamic

5.2.2.4 Node [OSGi-root]/Deploy/Download/<d>/URI

This leaf node contains the URL of the DP to be downloaded. The URL points to the DLOTA Download Descriptor of the DP.

AccessType: Get, Add

Format: chr

Occurrence: One

Scope: Dynamic

5.2.2.5 Node [OSGi-root]/Deploy/Download/<d>/ID

This leaf node carries the unique ID of the DP. This value is set by the DMS server or the Local Management Entity and must have the value of the DeploymentPackage-Name manifest header of the DP see [6].

AccessType: Get, Add

Format: chr

Occurrence: One

Scope: Dynamic

5.2.2.6 Node [OSGi-root]/Deploy/Download/<d>/Operations

This is the parent node for download operations to be invoked on the DP identified by the ID parameter under the same <d> dynamic node.

AccessType: Get, Add

Format: node

Occurrence: One

Scope: Dynamic

5.2.2.7 Node [OSGi-root]/Deploy/Download/<d>/Operations/DownloadAndInstallAndActivate

It's used with Exec command to initiate the download and immediate installation of a DP. The Deployment Package is downloaded via OMA DLOTA 1.0 protocol with the OSGi specific Download Descriptor extension. When the command is executed, a dynamic node (sub-tree) is created under the [OSGi-

root]/Deploy/Inventory/Deployed node with the appropriate parameters (including the same ID) of the installed DP. If the sub-tree for the DP already exists - the ID is the same as of the DP to be downloaded - the sub-tree parameters are updated.

AccessType: Exec, Get, Add

Format: node

Occurrence: One

Scope: Dynamic

5.2.2.8 Node [OSGi-root]/Deploy/Download/<d>/Operations/Ext

This optional interior node designates a branch of the Operations sub-tree into which vendor specific extensions MAY be added, permanently or dynamically.

AccessType:

Format: node

Occurrence: ZeroOrOne

5.2.2.9 Node [OSGi-root]/Deploy/Download/<d>/Status

This leaf node holds the execution state of the device after an attempt to execute the download and deployment operations. This value indicates the execution state(s) following the invocation of the Exec command.

AccessType: Get, Add, Replace

Format: int

Occurrence: ZeroOrOne

Scope: Dynamic

The possible execution states are one of:

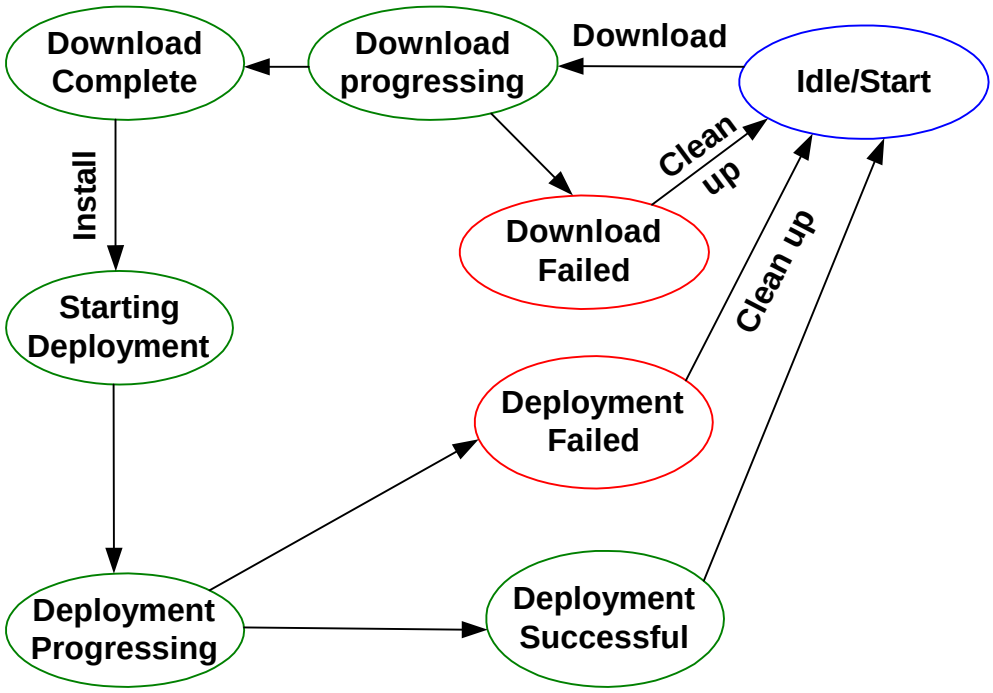

Figure 4. Execution status changes during download and install

The client sets the Status value with one of the possible values:

Status	Description	Integer Value
Idle / Start	There is no data available and download is about to start	10
Download Failed	Download failed and there is No data received	20
Download Progressing	Denotes that a download has started and that 0 or more bytes of data have been downloaded	30
Download Complete	Have data after Download has been completed successfully	40
Starting Deployment	Have data and about to start Deployment	50
Deployment Progressing	Denotes that the Deployment is currently running, but has not yet completed	60
Deployment Failed	Deployment failed	70

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Deployment Successful	Deployment complete.	80

5.2.2.10 Node [OSGi-root]/Deploy/Download/<d>/EnvType

This leaf node holds the value that indicates the environment for that the DP is to be downloaded. For OSGi DP this value must be: “OSGi.R4”.

AccessType: Get, Add

Format: chr

Occurrence: One

Scope: Dynamic

5.2.2.11 Node [OSGi-root]/Deploy/Download/<d>/Ext

This optional interior node designates a branch of the Download parameters sub-tree into which vendor specific extensions MAY be added, permanently or dynamically.

AccessType:

Format: node

Occurrence: ZeroOrOne

5.2.2.12 Node [OSGi-root]/Deploy/Inventory

This interior node is the parent node of the Deployed branch that populates the meta-data of the DPs actually deployed in the runtime environment.

AccessType: Get

Format: node

Occurrence: One

Scope: Permanent

5.2.2.13 Node [OSGi-root]/Deploy/Inventory/Delivered

This interior node is the parent node of the placeholder branches containing the parameters of the delivered DPs.

AccessType: Get

Format: node

Occurrence: One

Scope: Permanent

5.2.2.14 Node [OSGi-root]/Deploy/Inventory/Delivered<x>

This interior node is the placeholder node for a Deployment Package.

AccessType: Get, Add, Delete

Format: node

Occurrence: ZeroOrMore

Scope: Dynamic

5.2.2.15 Node [OSGi-root]/Deploy/Inventory/Delivered/<x>/ID

This leaf node contains the unique ID of the DP. This value is set by the originator of the package (either DMS or a Local Entity for DPs delivered to the device via different technology, than OMA DM) and must have the value of the DeploymentPackage-Name Manifest header of the DP see [6].

AccessType: Get

Format: chr

Occurrence: One

Scope: Dynamic

5.2.2.16 Node [OSGi-root]/Deploy/Inventory/Delivered/<x>/Data

This leaf node value refers to the DP stored on the device.

AccessType: Get

Format: chr

Occurrence: One

Scope: Dynamic

5.2.2.17 Node [OSGi-root]/Deploy/Inventory/Delivered/<x>/Descriptor

This leaf node includes the DLOTA Download Descriptor of the DP if exists.

AccessType: Get

Format: xml

Occurrence: ZeroOrOne

Scope: Dynamic

5.2.2.18 Node [OSGi-root]/Deploy/Inventory/Delivered/<x>/EnvType

This leaf node value indicates for which run-time environment the DP is targeted. It must have the value:”OSGi.R4”.

AccessType: Get

Format: chr

Occurrence: One

Scope: Dynamic

5.2.2.19 Node [OSGi-root]/Deploy/Inventory/Delivered/<x>/Operations/Remove

This node with Exec command is used to start the removal (uninstall) of the DP identified by the ID parameter of the same <x> branch.

AccessType: Exec

Format: Boolean

Occurrence: One

Scope: Dynamic

5.2.2.20 Node [OSGi-root]/Deploy/Inventory/Delivered/<x>/Operations/InstallAndActivate

This node with Exec command is used to start the installation of a DP, which is in Delivered state and identified by the ID of the same <x> branch. After the command is executed successfully the <x> sub-tree is deleted. If a sub-tree under the [OSGi-root]/Deploy/Inventory/Deployed node with the same ID doesn't exist, it's created, otherwise the existing sub-tree is updated.

AccessType: Exec

Format: Boolean

Occurrence: One

Scope: Dynamic

5.2.2.21 Node [OSGi-root]/Deploy/Inventory/Delivered/<x>/Operations/Ext

This optional interior node designates a branch of the Operations sub-tree into which vendor extensions MAY be added, permanently or dynamically.

AccessType:

Format: node

Occurrence: ZeroOrOne

5.2.2.22 Node [OSGi-root]/Deploy/Inventory/Delivered/<x>/Ext

This placeholder node is the parent node of the OSGi environment extension branch and may be the placeholder of any vendor specific extension.

AccessType: Get

Format: node

Occurrence: ZeroOrOne

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Scope: Dynamic

5.2.2.23 Node [OSGi-root]/Deploy/Inventory/Deployed

This interior node is the parent node of the placeholder branches containing the parameters of the deployed DPs.

AccessType: Get

Format: node

Occurrence: One

Scope: Permanent

5.2.2.24 Node [OSGi-root]/Deploy/Inventory/Deployed/<y>

This interior node is the placeholder node for a deployed Deployment Package.

AccessType: Get, Add, Delete

Format: node

Occurrence: ZeroOrMore

Scope: Dynamic

5.2.2.25 Node [OSGi-root]/Deploy/Inventory/Deployed/<y>/ID

This leaf node contains the unique ID of the DP that is the value of the DeploymentPackage-Name Manifest header of the DP see [6].

AccessType: Get

Format: chr

Occurrence: One

Scope: Dynamic

5.2.2.26 Node [OSGi-root]/Deploy/Inventory/Deployed/<y>/EnvType

This leaf node indicates that the DP is targeted for the OSGi environment. It must have the value: “OSGi.R4”.

AccessType: Get

Format: chr

Occurrence: One

Scope: Dynamic

5.2.2.27 Node [OSGi-root]/Deploy/Inventory/Deployed/<y>/Operations/Remove

This node with Exec command is used to start the removal of the DP identified by the ID parameter of the same <y> branch.

AccessType: Exec

Format: Boolean

Occurrence: One

Scope: Dynamic

5.2.2.28 Node [OSGi-root]/Deploy/Inventory/Deployed/<y>/Operations/Ext

This optional interior node designates a branch of the Operations sub-tree into which vendor extensions MAY be added, permanently or dynamically.

AccessType:

Format: node

Occurrence: ZeroOrOne

5.2.2.29 Node [OSGi-root]/Deploy/Inventory/Deployed/<y>/Ext

This placeholder node is the parent node of the OSGi environment extension branch and may be the placeholder of any vendor specific extension.

AccessType: Get

Format: node

Occurrence: ZeroOrOne

Scope: Dynamic

5.2.2.30 Node [OSGi-root]/Deploy/Inventory/Deployed/<y>/Ext/Version

This node allows querying of the deployment package version as declared in the DeploymentPackage-Version manifest header of the DP. This shares the format as the Deployment Package header see [6].

AccessType: Get

Format: chr

Occurrence: One

Scope: Dynamic

5.2.2.31 Node [OSGi-root]/Deploy/Inventory/Deployed/<y>/Ext/Bundles

This node is the parent node of information nodes of bundles belonging to the DP.

AccessType: Get

Format: node

Occurrence: One

Scope: Dynamic

5.2.2.32 Node [OSGi-root]/Deploy/Inventory/Deployed/<y>/Ext/Bundles/<BUNDLEID>

BUNDLEID represents the ID of the bundles belonging to the deployment package. The <BUNDLEID> is equal to the ID of the bundle.

AccessType: Get

Format: node

Occurrence: ZeroOrMore

Scope: Dynamic

5.2.2.33 Node [OSGi-root]/Deploy/Inventory/Deployed/<y>/Ext/Bundles/<BUNDLEID>symbolicName

This leaf node contains the symbolic name of the bundle.

AccessType: Get

Format: chr

Occurrence: One

Scope: Dynamic

5.2.2.34 Node [OSGi-root]/Deploy/Inventory/Deployed/<y>/Ext/Bundles/<BUNDLEID>location

This leaf node contains the location identifier of the bundle.

AccessType: Get

Format: chr

Occurrence: One

Scope: Dynamic

5.2.2.35 Node [OSGi-root]/Deploy/Inventory/Deployed/<y>/Ext/Bundles/<BUNDLEID>version

This leaf node contains the version of the bundle.

AccessType: Get

Format: chr

Occurrence: One

Scope: Dynamic

5.2.2.36 Node [OSGi-root]/Deploy/Inventory/Deployed/<y>/Ext/Bundles/<BUNDLEID>state

This leaf node contains the lifecycle state of the bundle. The value of this node must be one of the followings:

NOTAVAILABLE is represented by a value of 0

INSTALLED is represented by a value of 2

RESOLVED is represented by a value of 4

STARTING is represented by a value of 8

STOPPING is represented by a value of 16

ACTIVE is represented by a value of 32

AccessType: Get

Format: int

Occurrence: One

Scope: Dynamic

5.2.2.37 Node [OSGi-root]/Deploy/Inventory/Deployed/<y>/Ext/ProcessorBundle

This node exists only if the bundle declared that it contains a resource processor. If present, the value of this management node is the value of the xx manifest header in the Name section of the bundle in the DP manifest and shares the same format as the Deployment Package header see [6].

AccessType: Get

Format: chr

Occurrence: ZeroOrOne

Scope: Dynamic

5.2.2.38 Node [OSGi-root]/Deploy/Inventory/Deployed/<y>/Ext/Processors

This node exists only if the deployment package declared resource processor with the xx manifest header in the Name section of the bundle in the DP manifest and its value shares the same format as the Deployment Package header see [6].

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AccessType: Get

Format: chr

Occurrence: ZeroOrOne

Scope: Dynamic

5.2.2.39 Node [OSGi-root]/Deploy/Inventory/Deployed/<y>/Ext/Bundles/<BUNDLEID>importPackage

This node is the parent of the underlying <z> nodes that contain the name and version of the import packages required by the bundle.

AccessType: Get

Format: node

Occurrence: ZeroOrOne

Scope: Dynamic

5.2.2.40 Node [OSGi-root]/Deploy/Inventory/Deployed/<y>/Ext/Bundles/<BUNDLEID>importPackage/<z>

This leaf node contains an imported package name and specification version separated by a semicolon.

AccessType: Get

Format: chr

Occurrence: ZeroOrMore

Scope: Dynamic

5.2.2.41 Node [OSGi-root]/Deploy/Inventory/Deployed/<y>/Ext/Bundles/<BUNDLEID>exportPackage

This node is the parent of the underlying <w> nodes that contain the name and version of the export packages provided by the bundle.

AccessType: Get

Format: node

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Occurrence: ZeroOrOne

Scope: Dynamic

5.2.2.42 Node [OSGi-root]/Deploy/Inventory/Deployed/<y>/Ext/Bundles/<BUNDLEID>exportPackage/<w>

This leaf node contains an exported package name and specification version separated by a semicolon.

AccessType: Get

Format: chr

Occurrence: ZeroOrMore

Scope: Dynamic

5.2.2.43 Node [OSGi-root]/Deploy/Inventory/Deployed/<y>/Ext/Bundles/<BUNDLEID>nativeCode

This leaf node contains the value of the Bundle-NativeCode manifest header of the bundle.

AccessType: Get

Format: chr

Occurrence: ZeroOrOne

Scope: Dynamic

5.2.2.44 Node [OSGi-root]/Deploy/Inventory/Deployed/<y>/Ext/Bundles/<BUNDLEID>applicationDescriptor

This leaf node contains the content of the application descriptor file of the bundle.

AccessType: Get

Format: xml

Occurrence: ZeroOrOne

Scope: Dynamic

5.2.2.45 Node [OSGi-root]/Deploy/Ext

This optional interior node designates a branch of the Deploy sub-tree into which vendor specific extensions MAY be added, permanently or dynamically.

AccessType:

Format: node

Occurrence: ZeroOrOne

5.3 Agent Behaviour associated with the Deployment Management Object

5.3.1 …/Operations/Remove Exec command semantic

The Exec command for …/Operations/Remove node starts the execution of the removal operation. The Exec command is targeted to the Deployment Package represented by the branch including the Operations/Remove node.

```
<Exec>
    <CmdID>3</CmdID>
    <Item>
        <Target>
            <LocURI>[OSGi-root]/Deploy/Inventory/Deployed/ServerA/Operations/Remove</LocURI>
        </Target>
    </Item>
</Exec>
```

or

```
<Exec>
    <CmdID>3</CmdID>
    <Item>
        <Target>
            <LocURI>[OSGi-root]/Deploy/Inventory/Delivered/ServerB/Operations/Remove</LocURI>
        </Target>
    </Item>
</Exec>
```

When the Exec command is sent to the …/Operations/Remove node, the Client sends a status command for the Exec command back to the server. If the Exec command is successful than client begins the removal operation. To this operation the client sends the response back to the DMS by using the Generic Alert [3] after the operation is finished. If the operation was successful, client removes the sub-tree under the [OSGi-root]/Deploy/Inventory/Deployed/<y> or [OSGi-root]/Deploy/Inventory/Delivered/<x> on which the Exec command was invoked otherwise the state of the Deployment package must not change, i.e. the sub-tree must not be deleted

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5.3.2 Operations/InstallAndActivate Exec command semantic

The Exec command for this node starts the deployment of a DP which is in Delivered state and is on the Delivered sub-tree, identified by the same ID value that is included in the Exec command Data element:

```
<Exec>
    <CmdID>3</CmdID>
    <Item>
        <Target>
            <LocURI>[OSGi-root]/Deploy/Inventory/Delivered/ServerA/Operations/InstallAndActivate</LocURI>
        </Target>
    </Item>
</Exec>
```

When the Exec command is sent to this node, the Client sends a status command for the Exec command back to the server. If the Exec command is successful than client begins the deployment operation. To this operation the client must the response back to the DMS by using the Generic Alert [3] after the operation is finished. If the operation was successful, client removes the [OSGi-root]/Deploy/Inventory/Delivered/<x> sub-tree If there is no sub-tree with the same ID under the [OSGi-root]/Deploy/Inventory/Deployed node, a new one is created containing the same ID and with the parameters of the installed DP. If a sub-tree including the same ID already exists under the [OSGi-root]/Deploy/Inventory/Deployed node, the parameters of the DP is updated in this sub-tree. If the operation is unsuccessful, the Deployment Package must keep its previous state, i.e. the sub-tree must not be deleted.

5.3.3 DownloadAndInstallAndActivate Exec command semantic

When DM Exec command is sent to the [OSGi-root]/Deploy/Download/<d>/Operations/DownloadAndInstallAndActivate node, the Client sends a status command for the Exec command back to the server. If the Exec command is successful than client starts the download and immediate deployment of the downloaded package (DP). After the operations are finished, the client must send the response back to the DMS by using the Generic Alert [3] to indicate the URI of the dynamic node describing the deployed DP.

The Deployment Package specified by the [OSGi-root]/Deploy/Download/<d>/URI item is downloaded via the OMA OTA Download v1.0 [DLOTA] protocol [4] with the OSGi specific extension [5]. It's is the responsibility of the Download Manager to download only OSGi DP. The deployment operation is immediately launched via the Deployment API appropriate method.

Pre-Condition:

- [OSGi-root]/Deploy/Download/<d> dynamic node creation

The following objects need to be set with an appropriate value:

- [OSGi-root]/Deploy/Download/<d>URI
- [OSGi-root]/Deploy/Download/<d>/ID
- [OSGi-root]/Deploy/Download/<d>/EnvType.

```
<Exec>
    <CmdID>3</CmdID>
    <Item>
        <Target>
            <LocURI>[OSGi-root]/Deploy/Download/ServerA/Operations/DownloadAndInstallAndActivate</LocURI>
```

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```
            </Target>
        </Item>
    </Exec>
```

After the successful command execution a sub-tree under the [OSGi-root]/Deploy/Inventory/Deployed node is created for the DP including the ID parameter in the download branch. If such a sub-tree already exists, the parameters of the DP are updated.

5.3.4 Use of the Generic Alert

After the requested operation finished the DM server is notified about the outcome of the operation employing a Generic Alert message.

The alert message includes the following data:

- An integer result code – Used to report status of the operation.
- The URI of the dynamic node created or updated under [OSGi-root]/Deploy/Inventory/Deployed node – Used to identify the result.
- An alert type – Used to identify the operation
- Correlator – Used by the server and passed as part of the Exec command

Alerts that are reporting an error or failure condition SHOULD report a severity other than Informational in the Mark field of the Meta information. If the server needs to retrieve additional information, such as Status, then the server MAY query the device for those specific nodes.

5.3.4.1 Result Code

The result code of the operation MUST be sent as an integer value in the Data element of the GenericAlert [DMPRO] message. The ResultCode MUST be one of the values defined below:

Result Code	Error Message	Informative Description of Status Code Usage
200	Successful	Successful - The Request has Succeeded.
401	User Cancelled	User chose not to accept the request when prompted.
402	Corrupted Deployment Package	Corrupted Deployment Package, did not store correctly. Detected, for example, by mismatched CRC's between actual and expected.
403	Package Mismatch	Wrong Deployment Package delivered to device based on current device characteristics.
404	Not Acceptable	Delivered Content is Not Acceptable.
405	Authentication Failure	Authentication was Required but Authentication Failure was encountered.
406	Request Time-Out	Client has encountered a time-out.
407	Undefined Error	Indicates failure not defined by any other error code.
408	Malformed or Bad URL	The URL provided for DLOTA download did not provide access to the package. This may represent for example errors of type server

		down, incorrect URL and service errors.
409	The Download Server Temporarily Unavailable	The Download Server is Unavailable or Does not Respond.
410	Download Descriptor error	Indicates that the device could not interpret the DLOTA Download Descriptor. This typically means a syntactic error or the package does not match the attributes defined in the Download Descriptor. The device therefore rejects the package.
450	Deployment error: ordering	The manifest is not the first file in the stream or bundles don't precede resource files.
451	Deployment error: missing header	Missing mandatory manifest header.
452	Deployment error: bad header	Syntax error in any manifest header.
453	Deployment error: missing fixpack target	Fix pack version range doesn't fit to the version of the target deployment package or the target deployment package of the fix pack doesn't exist.
454	Deployment error: missing bundle	A bundle in the deployment package is marked as MissingResource-Bundle but there is no such bundle in the target deployment package.
455	Deployment error: missing resource	A resource in the deployment package is marked as MissingResource-Resource but there is no such resource in the target deployment package.
456	Failed Signature Authentication	Failure to positively validate digital signature of Deployment Package
457	Deployment error: bundle name error	Bundle symbolic name is not the same as defined by the deployment package manifest.
458	Deployment error: foreign customizer	Matched resource processor service is a customizer from another deployment package.
459	Deployment error: no such resource	A resource was passed to a matched resource processor but the resource processor doesn't manage this resource.
460	Deployment error: bundle sharing violation	Bundle with the same symbolic name already exists.
461	Deployment error: resource sharing violation	A side effect of any resource already exists.

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462	Deployment error: commit error	A resource processor is not able to commit the operations.
463	Deployment error: undefined	Undefined error during deployment.
464	Removal error	The Deployment Package was not removed.
470 -499	Client Error – Vendor Specified	Client Error encountered for Operation with Vendor Specified ResultCode
500	Download Server Error	Download Server Error Encountered
501-549	Reserved for Future Use	
550 -599	Download Server Error – Vendor Specified	Download Server Error encountered for Operation with Vendor Specified ResultCode

5.3.4.2 URI of the dynamic node

The URI of the dynamic node created or updated under [OSGi-root]/Deploy/Inventory/Deployed node MUST be sent as the target of the Generic Alert [DMPRO] message. This allows the Management Server to identify the result node in the alert.

5.3.4.3 Alert Types for the Deploy Management Object

One of the following alert types MUST be used in a Generic Alert [DMPRO] message originating from a Deployment Management Object. The alert types are used to identify the operation that was performed on the device.

org.osgi.deployment.download
org.osgi.deployment.delivered.remove
org.osgi.deploymentdeployed.remove
org.osgi.deploy.installandactivate

5.3.4.4 Correlator

If the server passes a correlator to the client in the Exec command for an operation, the client MUST return the same value to the server in the correlator field of the Generic Alert [DMPRO] message.
If the server does not pass a correlator to the client in the Exec command for an operation, the client MUST NOT send a correlator to the server in the correlator field of the Generic Alert [DMPRO] message.

5.3.5 Tree management

After an Exec command to …/Operations/Remove or Download/<d>/Operations/DownloadAndInstallAndActivate node it is the client responsibility to reflect the changes in the Inventory sub-tree. After the Deployment Package is

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delivered to and deployed on the device, the DP is tracked with the DP ID created from the DeploymentPackage-Name manifest header value of the DP see [6]. Deployment Admin maintains the meta-data of the DPs.

5.4 Device Management Server initiated download – message flow chart - informative

5.4.1 Description

Device Management Server sends a Notification for Session Initiation (Alert) to the device. If the device has an OMA DM session already, this step is not needed. User Interaction is controlled by the push message. If User Interaction is needed, DM framework prompts the user about the initiation of a DM session. Device Management Server adds a dynamic node under the Download node and sets the DLOTA Download Descriptor URI of the Deployment Package, the ID and EnvType via Add management commands and requests an Exec command on the Download/<d>/Operations/DownloadAndInstallAndActivate node.

DM framework passes the URL of the DLOTA DD to the Download Manager. The DD or the actual DP (that happens to be a JAR) is on separate server called Content storage. Download Manager gets the DLOTA DD and with the User is able to make informed decisions before initiating the download (e.g. Do I have enough storage space for this content? Do I want to pay for this content?) The device shows a dialog to the user for accepting the download of the DP. The dialog contains e.g. name, vendor and size of the application. If User accepts it the download starts. The downloaded DP is installed via the appropriate MEG Deployment API method invocation. Content Server has optionally received an installation notification indicating the download was a success or failure via an InstallNotify message sent.

At the completion of the installation process DM framework notifies the DMS server of the resulting status through a subsequent client or server initiated OMA DM session to assure that the management server is informed of the execution result.

DMS maintains the state of the individual devices and may request the actual state of the device via Inventory query before (and/or after) the download and installation of a DP.

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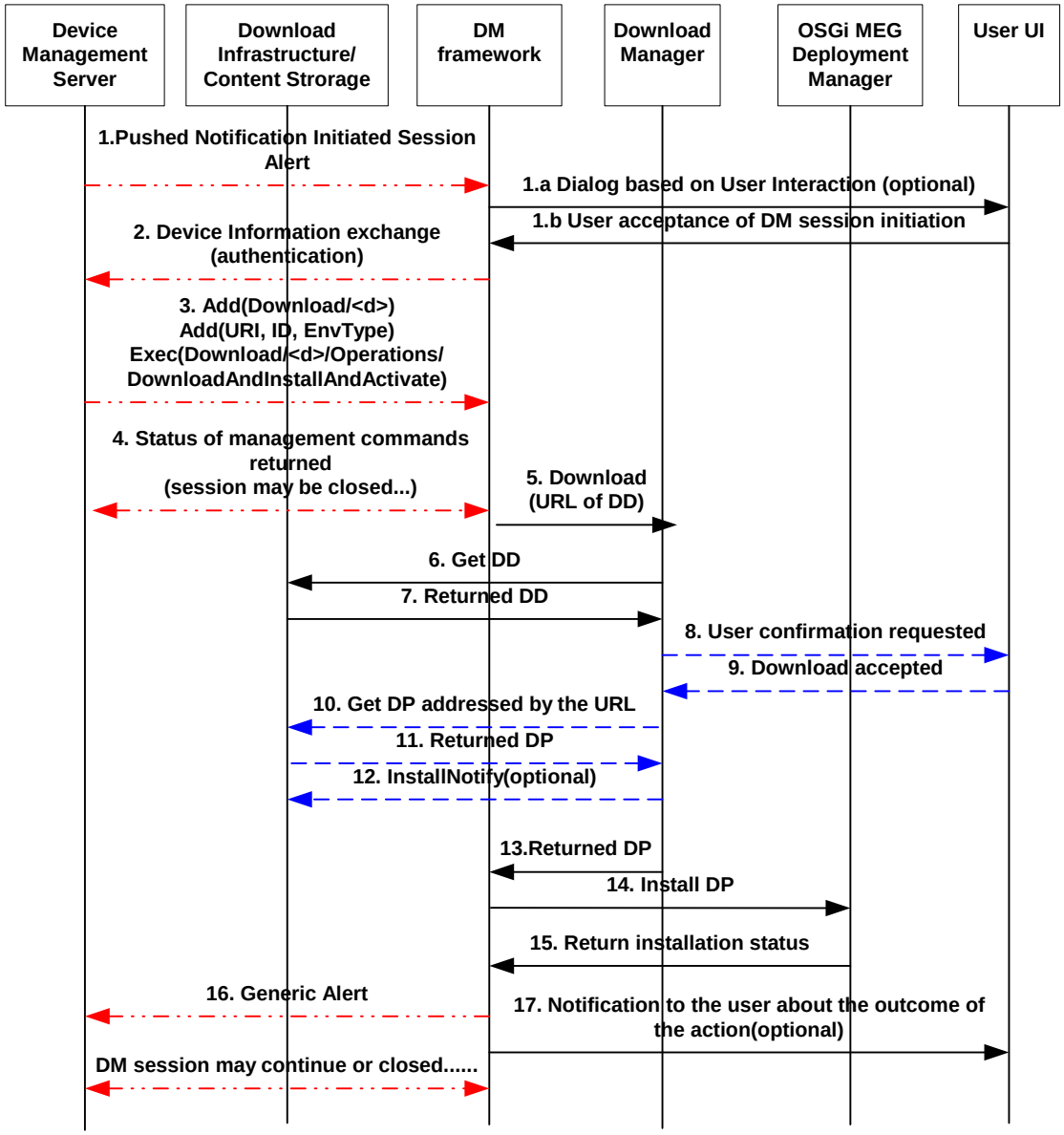

Figure 5. Server push via OMA DM

Notation:
- – – – Shows OMA DLOTA protocol interactions.
- – · – · Indicates OMA DM protocol interactions.

5.4.2 Normal flow

1. Notification Initiated Session Alert OMA DM command is pushed to the device. The Push message may be delivered via a Push Proxy Gateway or DMS may directly communicate with the device if it's able to operate as a PPG. If there is a DM session already between the device and DMS, the session initiation steps (1) aren't needed.

1a,b. The <ui-mode> field of the pushed message indicates the User Interaction Mode requested. This user action may be informative only or may require the user confirmation of the DM session initiation.

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2-4. Device DM framework initiates an OMA DM session with the DMS. As a minimum set of selection criteria, DevInfo parameters are sent to the server. This is mandatory for each OMA DM management session. The server sends the DM session management commands to create a dynamic node under the Download node and deliver the URI of the DLOTA DD of the OSGi DP, the ID and EnvType values and the execution request for the download and installation. Parties may close the DM session at this point.

5. Device DM framework calls Download Manager to download the OSGi DP. The URL of the DLOTA DD is passed.

6-9. After downloading the DLOTA DD some checks (e.g. capability) are performed. User confirmation is requested and the size of the package investigated. If the outcome of any of the investigation is negative, further steps for download will be aborted and the reason returned to the DM framework.

10-11. The OSGi content is downloaded.

12. If the installNotifyURI attribute in the Download Descriptor has been explicitly used, the Download Manager informs the status of the download to the server indicated in the installNotifyURI field of the descriptor. This only implies that the OSGi DP has been successfully downloaded. It does not imply that it has been processed.

13. Download Manager returns the downloaded DP.

14-15. Device DM framework installs the DP via OSGi MEG Deployment API and gets back the status of the installation operation.

16. Device DM framework notifies the DMS server of the resulting status through a (subsequent client or server initiated) OMA DM session. The result is provided to the DMS server via a Generic Alert notification. This DM session can continue to carry other DM related management commands from any side or closed if no other actions needed.

17. User is notified about the outcome of the action (optional).

6 Considered Alternatives

For posterity, record the design alternatives that were considered but rejected along with the reason for rejection. This is especially important for external/earlier solutions that were deemed not applicable.

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7 Security Considerations

Description of all known vulnerabilities this may either introduce or address as well as scenarios of how the weaknesses could be circumvented.

8 Document Support

8.1 References

[1]. Bradner, S., Key words for use in RFCs to Indicate Requirement Levels, RFC2119, March 1997.

[2]. Software Requirements & Specifications. Michael Jackson. ISBN 0-201-87712-0

[3]. "OMA Device Management Protocol, Version 1.2". Open Mobile Alliance™. OMA-TS-DM-Protocol-V1_2_0, URL:http://www.openmobilealliance.org

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

[5]. "MEG Download" OSGi RFC 105.

[6]. "MEG Deployment", OSGi RFC 88.

Add references simply by adding new items. You can then cross-refer to them by chosing <Insert><Cross Reference><Numbered Item> and then selecting the paragraph. ***STATIC REFERENCES (I.E. BODGED) ARE NOT ACCEPTABLE, SOMEONE WILL HAVE TO UPDATE THEM LATER, SO DO IT PROPERLY NOW.***

8.2 Author's Address

Name	
Company	
Address	
Voice	
e-mail	

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8.3 Acronyms and Abbreviations

8.4 End of Document