



# **OMA Device Management Bootstrap**

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# 1. Scope

This document defines how an OMA DM device is brought from a 'clean' state, to a state where it is capable to initiate a management session with a provisioned management server.

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### 2.1 Normative References

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## 2.2 Informative References

None.

## 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

See the DM Tree and Description [DMTND] document for definitions of terms related to the management tree.

<b>2G UICC</b>	UICC activated in a 2G mode that has physical characteristics of UICC [TS102.221] but logical characteristics of SIM [151.011].
<b>3G UICC</b>	UICC activated in a 3G mode that has physical and logical characteristics of the UICC [TS102.221].
<b>ADM</b>	Access condition to an EF which is under the control of the authority which creates this file.
<b>Application</b>	The implementation of a well-defined and related set of functions that perform useful work on behalf of the user. It may consist of software and or hardware elements and associated user interfaces.
<b>Application Identifier</b>	A data element that identifies an application in a smartcard. An application identifier may contain a registered application provider number in which case it is a unique identification for the application. If it contains no application provider number, then this identification may be ambiguous.
<b>Authentication</b>	Authentication is the process of ascertaining the validity of either the Device or the Device Management Server’s identity.
<b>Binary Files</b>	Binary Files are equivalent to transparent files as described in [TS102.221].
<b>Bootstrap</b>	The process of provisioning the DM client to a state where it is able to initiate a management session to a new DM server.
<b>Card Issuer</b>	The organization or entity that owns and provides a smartcard product.
<b>Cardholder</b>	The person or entity presenting a smartcard for uses.
<b>Cardholder Verification</b>	Also called the PIN. Typically a 4 to 8 digit number entered by the cardholder to verify that the cardholder is authorized to use the card.
<b>Command</b>	A message sent by the ME to the smartcard that initiates an action and solicits a response from the smartcard.
<b>Content</b>	Content means data delivered inside of OMA DM messages <Data>-elements.
<b>Data Object Directory Files</b>	Contain directories of data objects (not keys or certificates) ([PKCS#15], section 6.7) known to the PKCS#15 application.
<b>Dedicated File</b>	A file containing access conditions and, optionally, Elementary Files (EFs) or other Dedicated Files.
<b>Device</b>	The Device is, or is to become managed by one or more remote entities (Device Management Servers). A device may have many characteristics, and many parameters may be made available for reading, writing, deleting and modifying by a Device Management Server.
<b>Device Management Server</b>	The Device Management Server is an entity that is responsible for maintaining one or more Devices, in whole or in part. Its role is to facilitate the easy maintenance of a Device.
<b>Elementary File</b>	A set of data units or records that share the same identifier. It cannot be a parent of another file.
<b>File Identifier</b>	A 2-byte binary value used to address a file on a smartcard.
<b>Management Session</b>	A continuous connection between the Device and the Device Management Server established for the purpose of carrying out one or more device management operations.
<b>Message Authentication Code</b>	A value computed based on a message hash and some form of shared secret. The MAC is transported outside the bootstrap package.



<b>Object Directory File</b>	The mandatory Object Directory File ([PKCS#15], section 6.2) consists of pointers to other EFs, each one containing a directory over PKCS#15 objects of a particular class (here and below, a “directory” means a list of objects).
<b>Path</b>	Concatenation of file identifiers without delimitation. The Path type is defined in [ISO7816-4] sub-clause 5.1.2. If the path starts with the MF identifier (0x3F00), it is an absolute path; otherwise it is a relative path. A relative path must start with the identifier of the current DF (or with the identifier '0x3FFF').
<b>Record</b>	A string of bytes within an EF handled as a single entity.
<b>Smartcard</b>	A device with an embedded microprocessor chip. A smartcard is used for storing data and performing typically security related (cryptographic) operations. A smartcard may be the SIM, the UICC, the R-UIM or a smartcard used in a secondary smartcard reader of a device.
<b>UICC</b>	A physically secure device, an IC card (or smartcard), that can be inserted and removed from the device. It may contain one or more applications [TS102.221].

### 3.3 Abbreviations

<b>OMA</b>	Open Mobile Alliance
<b>WAP</b>	Wireless Application Protocol
<b>MAC</b>	Message Authentication Code
<b>2G</b>	Second generation network i.e. GSM
<b>3G</b>	Third generation network i.e. UMTS
<b>ADF</b>	Application Dedicated File
<b>AID</b>	Application Identifier
<b>ALW</b>	Always. Access condition indicating a given function is always accessible.
<b>CHV</b>	Cardholder Verification
<b>DF</b>	Dedicated File
<b>DIR</b>	Directory File
<b>DM</b>	Device Management
<b>DODF</b>	Data Object Directory Files
<b>EF</b>	Elementary File
<b>FCP</b>	File Control Parameter
<b>IC</b>	Integrated Circuit
<b>ID</b>	Identifier
<b>ME</b>	Mobile Equipment
<b>MF</b>	Master File
<b>ODF</b>	Object Directory File
<b>OID</b>	Object Identifier
<b>PIN</b>	Personal Identification Number
<b>SIM</b>	GSM Subscriber Identity Module

## 4. Introduction

Other OMA DM specifications define how a management session is established and maintained. However, in order for a device to be able to initiate a management session it must be provisioned with OMA DM settings.

Bootstrap is a process of provisioning the DM client to a state where it is able to initiate a management session to a new DM server. Bootstrap can move a device from an un-provisioned, empty state, to a state where it is able to initiate a management session to a DM server. DM clients that have already been bootstrapped can be further bootstrapped to enable the device to initiate a management session to new DM servers.

## 5. Bootstrapping

### 5.1 Bootstrap scenarios

OMA DM devices must be able to function in diverse network environments and using a large set of protocols. This makes it hard to find a 'one size fits all' solution to the bootstrap problem. This section starts with the most basic requirements for bootstrap and continues to define three different processes for bootstrap

#### 5.1.1 Requirements

An OMA DM solution capable of transforming an empty, clean device into a state where it is able to initiate a management session needs to address these requirements.

- Re-use technology (WAP Push)
- Tightly standardized and simple ⇒ Highly interoperable
- Self sufficient and complete
- Secure
- Data format should be XML based
- Content mappable to OMA DM management objects
- Transport encoding should be [WBXML1.1], [WBXML1.2], [WBXML1.3]

#### 5.1.2 Solutions

This document defines three different ways to perform the bootstrap process.

- Customized bootstrap  
Devices are loaded with OMA DM bootstrap information at manufacture. Also referred to as factory bootstrap.
- Server initiated bootstrap  
Server sends out bootstrap information via some push mechanism, e.g. WAP Push or OBEX. Server must receive the device address/phone number beforehand.
- Bootstrap from smartcard  
The smartcard is inserted in the device and the DM client is bootstrapped from the smartcard.

##### 5.1.2.1 Customized bootstrap

This is a convenient way to bootstrap a device from an end user perspective because the user does not have to do anything. In this scenario, an operator orders the devices pre-configured from a device manufacturer. All the information about the operator's network and device management infrastructure is already in the devices when they leave the factory. Another advantage of this method is that it is very secure. There is no need to transport sensitive commands and information, e.g. shared secrets, over the air. The method is however not very flexible and not all device manufacturers may provide this service. Not all devices are sourced via the operator. In this scenario, either the DM server or the Client initiates an OMA DM session after user personalizes and bootstraps the Device. If the server initiates management session, the Server is informed about Device address or phone number previously.

Figure 1 gives an overview of this scenario.

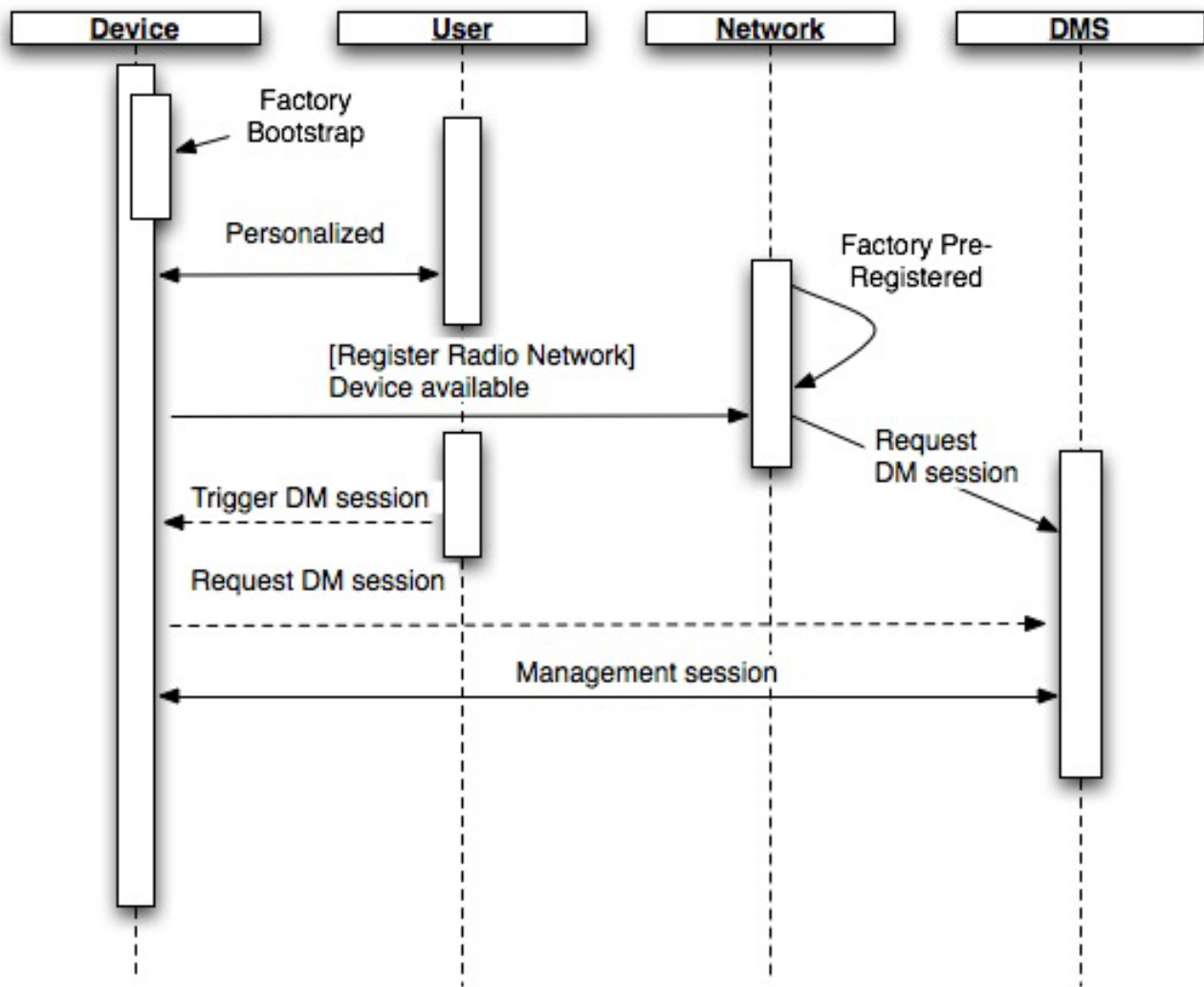


Figure 1: Customized bootstrap

**5.1.2.1.1 Bootstrap from smartcard**

This is a convenient way to bootstrap a device from an end user perspective because the user does not have to do anything. In this scenario the DM client is able to obtain the information necessary to bootstrap it from the smartcard. There is no need to transport sensitive bootstrap commands and information, e.g. shared secrets, over the air. The smartcard is secure, ensuring that the bootstrapping commands have been authorized. A device supporting the smartcard can be bootstrapped for DM without necessarily being purchased from the operator. In this scenario, either the DM Server or the Client initiates an OMA DM session after user bootstraps and personalizes the Device. If Server initiates management session, the Server is informed about Device address or phone number previously.

Figure 2 gives an overview of this scenario.

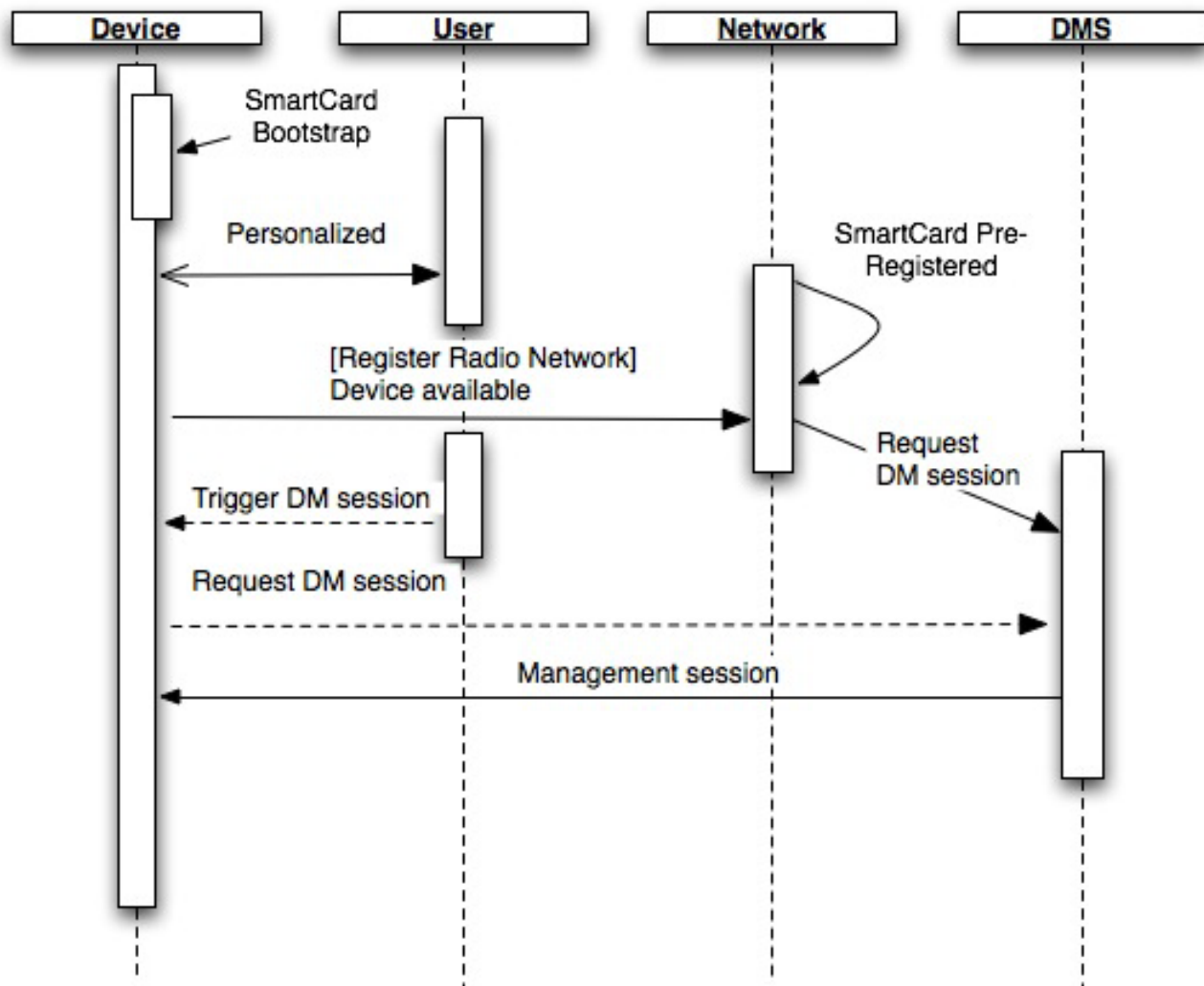


Figure 2: Bootstrap from smartcard

### 5.1.2.2 Server initiated bootstrap

In this scenario, the devices leave the assembly line in a clean and empty state. Once a user acquires a device and personalizes it, e.g. by inserting a SIM, the prerequisites for this process are in place. The problem is now to inform the server of the identity, address or phone number of the device and this can be achieved in many ways.

- It could be done at the point-of-sales where a sales system ties in with the management system and delivers the information.
- It could be done through a self-service web site where the user enters her own phone number.
- It could be done by the network the first time the device registers to the network. When this happens a trigger could be sent from the core network to the management server with the number used by the device.
- It could be done with a voice prompt system where the user is prompted to key in her phone number using DTMF.

Regardless of how the phone number or device address reaches the management server, the server is now in a position where it can send out an OMA DM bootstrap message. This bootstrap message, whose structure and content is defined in this document, contains enough information for the device to be able to initiate a management session with the device management server that sent out the bootstrap message.

It is important that DM clients accept bootstrapping commands only from authorized servers [DMSecurity].

Figure 3 gives an overview of this scenario.

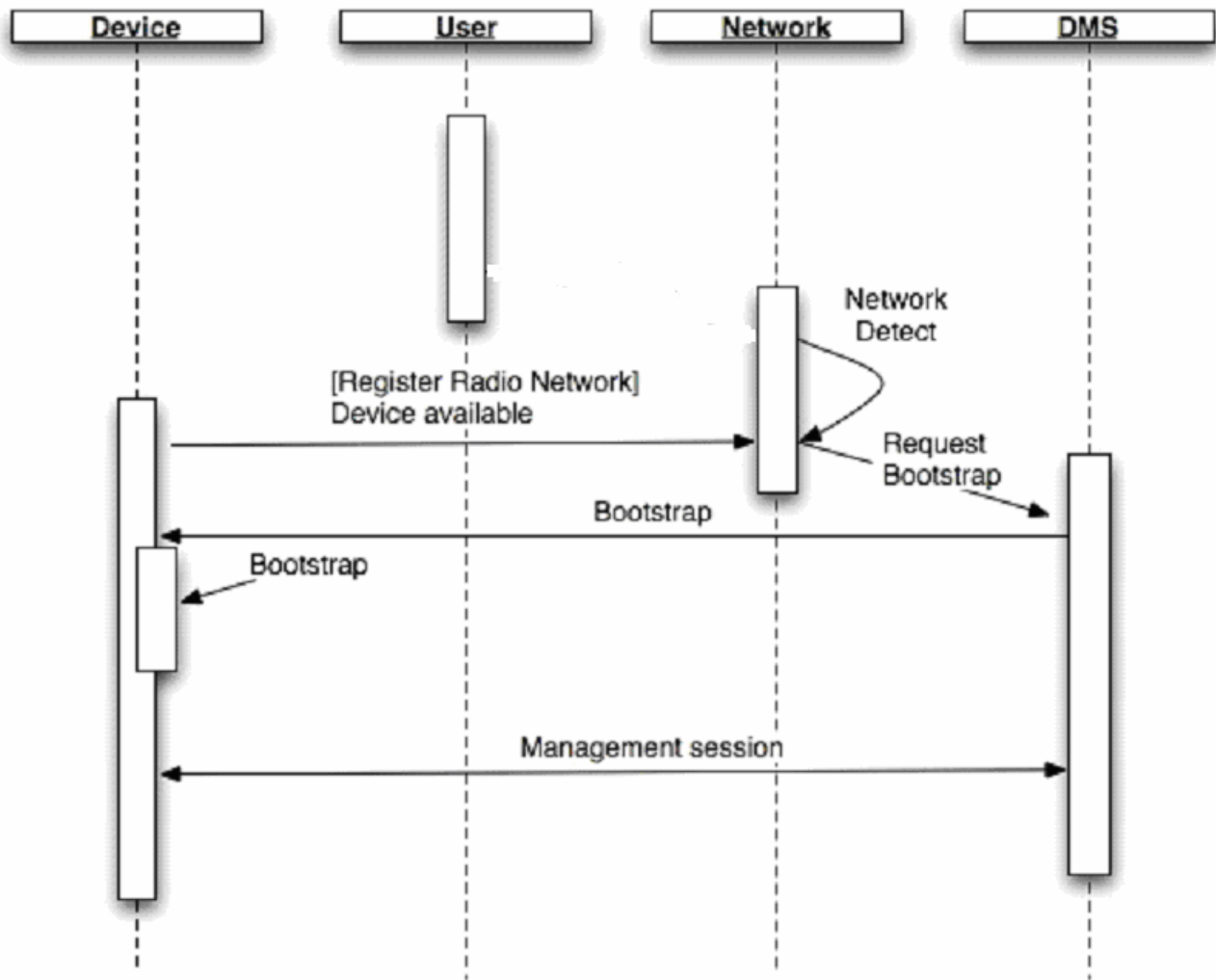


Figure 3: Server initiated bootstrap

## 5.2 Bootstrap profiles

OMA DM has been designed to meet the management requirements of many different types of devices. For some of these device types there already exists a bootstrap or provisioning mechanism. In these cases OMA DM leverages the existing mechanisms so that backwards compatibility and simple deployment can be achieved. To define how different kinds of devices can be bootstrapped and to specify how OMA DM leverages existing standards this document introduces the concept of bootstrap profiles. Each profile defines its own security, transport and data format. Support for any particular profile is OPTIONAL.

Currently two profiles are planned, but as interest in OMA DM grows and usage of it increases more profiles can be added. The two profiles are:

### OMA Client Provisioning

This profile specifies alignment of two existing enablers – OMA Client Provisioning [ERELDCP] and OMA Device Management [ERELDDM]. The profile defines how the information provisioned using OMA Client Provisioning can be transferred to the management tree specified in the OMA Device Management. In this profile at least the mapping of w7 (DM account) information to the management tree needs to be supported, but other provisioning information can also be mapped to the management tree.

### OMA Device Management

This profile defines how the OMA Device Management [ERELDDM] can be used for bootstrapping.

## 5.3 OMA Client Provisioning Profile

OMA Client Provisioning enabler [ERELDCP] is designed to provision the initial configuration information to devices, and can be used with OMA Device Management enabler [ERELDDM] to subsequently add, update, delete and retrieve all kind of data. The purpose of this chapter is to describe how to map the Client Provisioning information to the Device Management management tree in a way that later management for the provisioned parameters is possible in case both Client Provisioning and Device Management enablers are supported by the client device.

The content of the Bootstrap message is based on the OMA Provisioning Content Specification [PROVCONT]. In order to enable the usage of the OMA Provisioning Content Specification within the OMA Device Management Framework, the DM application registration document w7 is released by DM group to provide information how the APPLICATION characteristic in OMA Provisioning content [PROVCONT] is used to provision OMA Device Management enabler [ERELDDM] parameters.

### 5.3.1 Transports

Bootstrapping using OMA Client Provisioning profile is done as defined in the OMA Provisioning Bootstrap specification [PROVBOOT].

### 5.3.2 Mapping Characteristic Data to the Management Tree

When device receives Client Provisioning document the device creates a management object for that information to the management tree in order to enable the subsequent management. Management object can have two different types of name space identifiers (Property Name described in [DMTND]) - One where the name is already given in the DDF [DMTND] and another where the name is dynamic separating the instances of the child nodes (See Figure 3: Example Management Object and Name Identifiers).

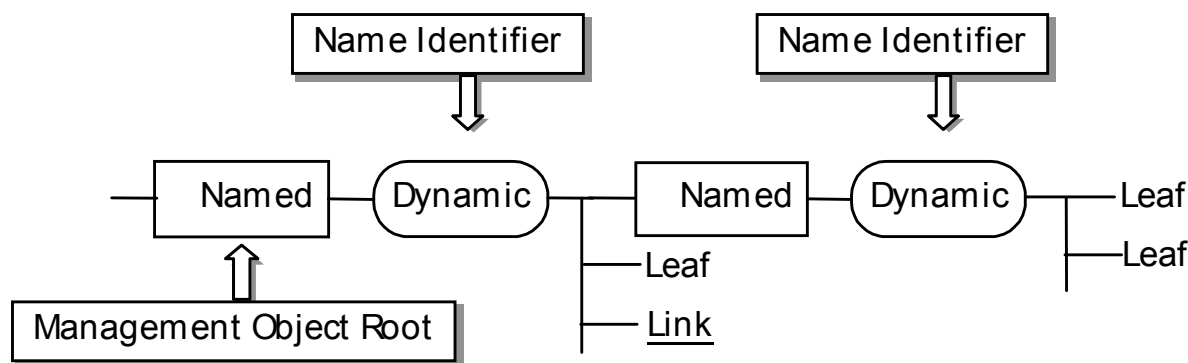


Figure 3: Example Management Object and Name Identifiers

The name identifiers for named nodes are already given in the management object DDF. Also, the parameter mapping between Client Provisioning parameters and Management Object parameters MAY be specified in the Management Object specification. In addition a general rule that SHOULD be followed to map named information between Client Provisioning APPLICATION characteristic and standardized Application Connectivity Management Object template structure is given in Appendix C.

The client device gives the name identifiers for dynamic nodes that are separating the instances of the child nodes. Though the format of name identifiers for these dynamic nodes is implementation specific, a client MAY assign numeric identifiers starting from '1' and increasing by one every time. In this case and when there is priority specified in the Provisioning Content document the rank SHOULD reflect that.

### 5.3.3 Management Object Location in the Management Tree

Newly created management object location in the management tree is decided by client device. However, it MUST be placed following the published DDF of the management tree so that the server is able to know where to find the provisioned information.

### 5.3.4 Management Object Access Rights

All provisioning information mapped from the Provisioning Content [PROVCONT] document to management tree MUST be granted Get, Replace and Delete ACL rights to the ServerID specified in the w7 APPLICATION characteristic provisioned inside Provisioning Content message. The management authority owning the ServerID may modify this ACL in a subsequent DM session.

In case w7 APPLICATION characteristic is not part of the provisioning message client device receiving the message and mapping the information to the DM management tree MUST NOT give the access rights to these parameters to the improper management authority.

### 5.3.5 Special Behaviors

#### 5.3.5.1 Smart Card Provisioning

In case Smart Card contains the provisioning information as specified in the [PROVSC] device SHOULD detect the removal and/or change of the Smart Card. When the Smart Card is removed and/or changed, the client device SHOULD remove all the provisioned management object information (from the Smart Card) from the management tree.

### 5.3.6 Device Management, Access Point and Proxy Information

Devices supporting both Client Provisioning and Device Management MUST be able to map w7 (Device Management account) and NAPDEF (if supported) and PROXY (if supported) characteristics information to the management tree. The mapping of the named nodes is specified in [DMSTDOBJ].

In case device supports the management objects specified in [DMSTDOBJ] a mapping is described in Appendix B in [DMSTDOBJ].

Client device MUST give the names for the dynamic nodes as described in Section 5.3.2.

### 5.3.7 Other Client Provisioning information

Devices supporting both Client Provisioning and Device Management MAY decide to map other information provisioned in the Client Provisioning message to the management tree. A general mapping is described in Appendix C, but in case a specific mechanism is described in the Management Object document that MUST be followed.

## 5.4 OMA Device Management Profile

The content of the Bootstrap message is a standard OMA DM message that MUST be encoded into [WBXML1.1], [WBXML1.2], [WBXML1.3]. Clients MUST support embedded WBXML encoded TNDIS objects [DMTNDIS] and MUST support the inbox. In order to be bootstrapped successfully the DM client requires both DM account information and connectivity information. It is RECOMMENDED to use standardized connectivity MOs to represent the connectivity information.



## 5.4.1 Transport

Any transport MAY be used to send the Bootstrap message to the DM client. Security appropriate for bootstrapping a device securely, and appropriate for the transport used MUST be employed. Otherwise, transport neutral security MUST be employed. See the security document for further information [DMSecurity].

## 5.4.2 Management tree ACL and bootstrap

The policy that the device consults to decide if a bootstrap message will be accepted and what access rights to be granted for the new management authority is outside the scope of this specification. If a bootstrap message is accepted it MUST be processed according to the conditions described in section 5.4.5, in order for the bootstrap to be successful.

## 5.4.3 Management Object Access Rights

Any ACL values that is to be set for the new management objects added in the DM Bootstrap message, MUST be included in the TNDS data as ACL property data for the applicable nodes.

## 5.4.4 Bootstrap Message Content

The content of a bootstrap message is an OMA DM message. However, it is a special package in many ways since it is not part of an ongoing OMA DM session but rather a one-time transfer of information. Hence, many of the elements needed to manage the session are superfluous in the context of bootstrapping, but they must still be included so that the message may be processed by the normal OMA DM client.

All OMA DM bootstrap messages MUST be [WBXML1.1], [WBXML1.2], [WBXML1.3] encoded.

OMA DM servers MUST NOT expect any Status for the command in a bootstrap package. An implicit acknowledgement of successful bootstrap can be concluded when the client connects to the server for the first management session.

A typical bootstrap message will set the values for the DMAcc management object defined in [DMSTDOBJ].

## 5.4.5 Processing of the Bootstrap

A Bootstrap message is processed just like a normal DM message, except that a response MUST NOT be sent back.

The device MAY rename a new Connectivity MO and also rename the values of the corresponding PrefConRef or ConRef to the new name.

When a TNDS object contains a DM Account where ConRef or PrefConRef are linked to a Connectivity or Proxy MO that also are included in the same TNDS object, then the ConRef or PrefConRef MAY contain a URI that starts with “./Inbox”. In that case the URI MUST have the value of “./Inbox/” plus the URI of that Connectivity MO’s location in the same TNDS object.

This is an example of a TNDS object there only part of the TNDS object is shown:

```
<MgmtTree>
.
.   <VerDTD>1.2</VerDTD>
.   <Node>
.       <nodeName>OperatorX</nodeName> <!-- DM Account MO -->
.       <RTPProperties>
.           <Format>
.               <node/>
.           </Format>
.           <Type>org.openmobilealliance/1.0/w7</Type>
.       </RTPProperties>
.       <Node>
.           <nodeName>PrefConRef</nodeName>
.           <RTPProperties>
.               <Format>
.                   <chr/>
.               </Format>
.               <Type>text/plain</Type>
.           </RTPProperties>
```

```
        <Value>./Inbox/Internet</Value>
    </Node>
    ...
    .   <nodeName>Internet</nodeName> <!-- Connectivity MO -->
    .   <RTProperties>
    .       <Format>
    .           <node/>
    .       </Format>
    .       <Type>org.openmobilealliance/1.0/ConnMO</Type>
    .   </RTProperties>
    .
    .       </Node>
</MgmtTree>I
```

If a device encounters an item with a URI of the EXT sub-tree that it is not prepared to handle, the device MAY ignore that item in order that the bootstrap may succeed.

After successfully processing the bootstrap, the OMA DM client SHOULD automatically initiate a client-initiated session to any DM server configured in the bootstrap at the next practical opportunity (i.e., when network connectivity and other factors would allow such a connection).

## 5.4.6 Smartcard

If the Device supports a smartcard, the DM Client MUST support detection, retrieval, and processing of bootstrap data from the smartcard as described in Appendix D. The DM Client MAY include configurable security policy to disable smartcard bootstrap functions. If the smartcard bootstrap function is enabled and the smartcard has not been rejected by the device (for example, because of a SIM-locking mechanism), the DM Client SHALL retrieve bootstrap data from the smartcard when the device is switched on and apply it to the device configuration.

The device SHOULD check that the bootstrap data for all DM servers previously bootstrapped from the smartcard are still available from the smartcard when the device is switched on; if not, the account information for any DM Servers that were previously bootstrapped from the smartcard but are no longer stored on the smartcard SHOULD be removed from the device management configuration.

## Appendix A. Change History (Informative)

### A.1 Approved Version History

Reference	Date	Description
OMA-SyncML-DM-Bootstrap-V1_1_2-20031209-A	09 Dec 2003	Initial OMA release.

### A.2 Draft/Candidate Version 1.2 History

Document Identifier	Date	Sections	Description
Draft Versions OMA-DM_Bootstrap-V1_2	19 Nov 2004	All	Applied new template, CRs OMA-DM-2004-0087R02-CR_Alignment, OMA-DM-2004-0164R04-LATE-DMAcc_MO, and OMA-DM-2004-0221R07-CR_DM_Bootstrap. Removed SyncML where appropriate.
	01 Dec 2004	All	Editorial changes.
	15 Dec 2004	B	Applied CR OMA-DM-2004-0331R01-CR_Bootstrap_SCR
	04 Jan 2005	All	Editorial Changes. Updated references and SCR.
	05 Jan 2005	2,B	Added in missing reference to [IOPPROC].
	14 Jan 2005	C	Corrected some capitalization.
	25 Jan 2005	All	Minor editorial changes.
Draft Version OMA-TS-DM_Bootstrap-V1_2	31 Jan 2005	All	Removed extraneous quote from section 5.4.1. Renamed document to include "TS".
	03 Feb 2005	2.1, 3, 5, A and D	Applied CR 2005-0067R01, and CR 2005-0068R03.
	16 Feb 2005	All	Updated copyright to include 2005. Applied CR 2005-0080.
	22 Feb 2005	All	Applied CR 2005-0088R02.
	31 Mar 2005	All	Applied CRs 2005-0103, 2005-0113, and 2005-0126R01.
	18 Apr 2005	All	Correctly applied 2005-0113. Applied 2005-0191.
	19 Apr 2005	5.4	Fixed header formatting.
OMA-TS-DM_Bootstrap-V1_2	26 Apr 2005	5.4, B	Applied 2005-0182 and 2005-0197.
	03 May 2005	Filename Coverpage References,D	Changed DM 1.2.0 to 1.2 Fixed header formatting.
Candidate Versions OMA-DM_Bootstrap-V1_2	11 May 2005	D.4.2	Changed OID value, according to CR 2005-0222
	07 Jun 2005	n/a	Candidate version approved by TP R&A OMA-TP-2005-0137R01-DM-V1_2-for-Candidate-approval
	15 Jun 2005	5.4.5	CR implemented DM-2005-0232R01, 0233R02.
	16 Dec 2005	5.1	CR implemented DM-2005-0418R07
	18 Apr 2006	2.1, 5.1.1, 5.4, 5.4.4 5.4.2	Inclusion of CR: OMA-DM-2006-0031R02 OMA-DM-2006-0055R03

## Appendix B. Static Conformance Requirements (Normative)

The notation used in this appendix is specified in [IOPPROC].

### B.1 SCR for Bootstrap Client

Item	Function	Reference	Status	Requirement
DM-BOOT-C-001	Support for OMA Client Provisioning Profile	Section 5.3	O	ProvBoot:ProvBoot-B-C-001 AND DM-BOOT-C-003
DM-BOOT-C-002	Support for OMA Device Management Profile	Section 5.4	O	DM-BOOT-C-010 AND DM-BOOT-C-011
DM-BOOT-C-003	Provisioning Content granted Get, Replace and Delete ACL rights to ServerID in w7.	Section 5.3.4	O	
DM-BOOT-C-004	Support for OMA Client Provisioning Profile AND OMA Device Management	Section 5.3.6	O	DM-BOOT-C-005
DM-BOOT-C-005	Map w7, NAPDEF (if supported) and PROXY (if supported) to management tree.	Section 5.3.6	O	
DM-BOOT-C-006	Device supports a Smartcard.	Section 5.4.6	O	DM-BOOT-C-007
DM-BOOT-C-007	DM Client is capable of detecting, retrieving, and processing DM Profile bootstrap data from the Smartcard.	Section 5.4.6	O	
DM-BOOT-C-008	Smartcard bootstrap function is enabled by DM client and the smartcard has not been rejected by the device.	Section 5.4.6	O	DM-BOOT-C-009
DM-BOOT-C-009	Device retrieves bootstrap data from the Smartcard and applies it to the device configuration.	Section 5.4.6	O	
DM-BOOT-C-010	Support for embedded WBXML encoded TNS objects.	Section 5.4	O	
DM-BOOT-C-011	Support for Inbox.	Section 5.4	O	

### B.2 SCR for Bootstrap Server

Item	Function	Reference	Status	Requirement
DM-BOOT-S-001	Support for OMA Client Provisioning Profile	Section 5.3	O	
DM-BOOT-S-002	Support for OMA Device Management Profile	Section 5.4	O	DM-BOOT-S-003

Item	Function	Reference	Status	Requirement
DM-BOOT-S-003	Encode DM message into WBXML.	Section 5.4	O	

## Appendix C. General Mapping

In the below table the Provisioning Content APPLICATION characteristic correspondence is shown to the Structure Template for Application Connectivity Management Object.

APPLICATION CHARACTERISTIC INFORMATION	STRUCTURE TEMPLATE FOR APPLICATION CONNECTIVITY MANAGEMENT OBJECT
APPID	AppID
PROVIDER-ID	ProviderID
NAME	Name
AACCEPT	AAccept
APROTOCOL	AProtocol
TO-PROXY	PrefConDef, if multiple ToConRef/<X>/ConRef
TO-NAPID	PrefConDef, if multiple ToConRef/<X>/ConRef
ADDR	PrefAddr
APPADDR/ADDR	AppAddr/<X>/Addr
APPADDR/ADDRTYPE	AppAddr/<X>/AddrType
APPADDR/PORT/PORTNBR	AppAddr/<X>/Port/<X>/PortNbr
APPADDR/PORT/SERVICE	AppAddr/<X>/Port/<X>/Service/<X>/Service
APPAUTH/AAUTHLEVEL	AppAuth/<X>/AAuthLevel
APPAUTH/AAUTHTYPE	AppAuth/<X>/AAuthType
APPAUTH/AAUTHNAME	AppAuth/<X>/AAuthName
APPAUTH/AAUTHSECRET	AppAuth/<X>/AAuthSecret
APPAUTH/AAUTHDATA	AppAuth/<X>/AAuthData
RESOURCE/URI	Resource/<X>/URI
RESOURCE/NAME	Resource/<X>/Name
RESOURCE/AACCEPT	Resource/<X>/AAccept
RESOURCE/AAUTHTYPE	Resource/<X>/AAuthType
RESOURCE/AAUTHNAME	Resource/<X>/AAuthName
RESOURCE/AAUTHSECRET	Resource/<X>/AAuthSecret
RESOURCE/AAUTHDATA	Resource/<X>/AAuthData
RESOURCE/STARTPAGE	N/A

**Table 1: General Mapping**

## Appendix D. Storage of DM bootstrap data on the Smartcard (Normative)

We can sort out three main types of smartcards used for wireless telecom networks, characterised by their physical and logical characteristics:

- SIM smartcards platforms [TS151.011]
- UICC smartcards platforms [TS102.221]
- R-UIM smartcards platform [C.S0023-B\_v1.0]

This section aims at specifying the storage mechanism of DM bootstrap data on such smartcard platform type.

For the purposes of this document the R-UIM is to be treated according to the rules defined for the SIM.

### D.1 File structure

The information format is based on [PKCS#15] specification. The bootstrap data are located under the PKCS#15 directory allowing the card issuer to decide the identifiers and the file locations. The smartcard operations that are relevant for the bootstrap operation include:

- Application selection
- Cardholder verification
- File access (select file, read, write)

The [PKCS#15] specification defines a set of files. Within the PKCS#15 application, the starting point to access these files is the Object Directory File (ODF). The EF(ODF) contains pointers to other directory files. These directory files contain information on different types of objects (authentication objects (PIN), data objects, etc). For the purpose of DM bootstrap, EF (ODF) MUST contain the record describing the DODF-bootstrap. The EF(ODF) is described in section D.4.1 and [PKCS#15].

EF(ODF) contains pointers to one or more Data Object Directory Files (DODF). Each DODF is regarded as the directory of data objects known to the PKCS#15 application. For the purposes of DM bootstrap, EF(DODF-bootstrap) contains pointer to the bootstrapping data object, namely DM\_Bootstrap File. The EF(DODF-bootstrap) is described in section D.4.2 and [PKCS#15].

The provisioning files are stored as PKCS#15 opaque data objects.

The support of DM smartcard bootstrap data will be indicated to the ME's user agent, by the presence in the EF DIR (see [TS102.221]) of an application template as defined here after.

The recommended format of EF(DIR) is a linear fixed record in order to be in line with [TS102.221].

EF (DIR) MUST contain the application template used for a PKCS#15 application as defined in [PKCS15]. Application template MUST consist of Application identifier (tag 0x4F) and Path (tag 0x51) information.

The EF(ODF) and EF(DODF-bootstrap) MUST be used by the ME to determine the path of the DM\_Bootstrap file.

UICC smartcard platforms can support two modes of activation: 2G and 3G. UICC smartcard platform activated in a 2G mode has the logical characteristics of the SIM smartcard platform [TS151.011]. In that case, smartcard operation for accessing DM bootstrap data conform to the ones defined for the SIM as specified in section D.2.

UICC smartcard platform activated in a 3G mode has the physical and logical characteristics according to [TS102.221]. In that case, smartcard operations for accessing DM bootstrap data are specified in section D.3.

## D.2 Bootstrap data on SIM or UICC activated in 2G mode

### D.2.1 Access to the file structure

To select the PKCS15 application, the ME MUST evaluate the PKCS#15 application template present in the EF (DIR), then the ME MUST use the indirect selection method as defined in [TS151.011] to select the application.

### D.2.2 Files Overview

The file structure for the DM bootstrap data within the SIM smartcard is described below.

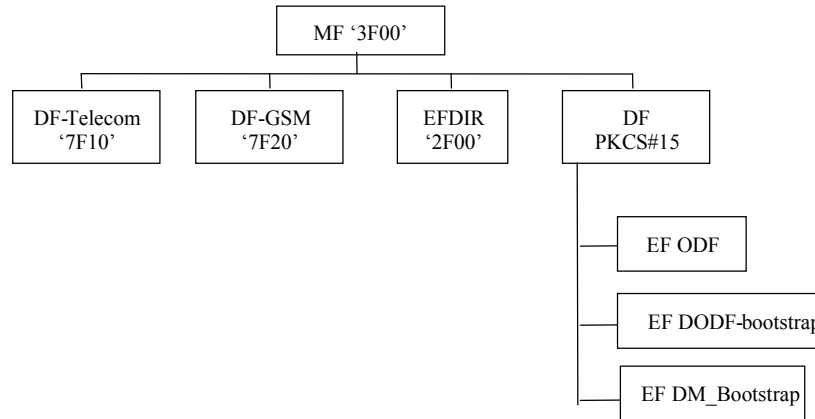


Figure 4: File structure for DM bootstrap data on SIM smartcard or 2G UICC

### D.2.3 Access Method

SIM commands Read Binary and Update Binary, as defined in [TS151.011], are used to access bootstrap data.

### D.2.4 Access Conditions

The ME is informed of the access conditions of the bootstrap file by evaluating the “private” and “modifiable” flags in the corresponding DODF-bootstrap files structure. When one of these flags is set cardholder verification is required. The CHV1 MUST be verified as defined in [TS151.011] when the “private” or “modifiable” flags are set.

Access conditions for files are proposed in the section D.4.

### D.2.5 Requirements on the SIM or 2G UICC

To support the DM smartcard bootstrap on the SIM or 2G UICC, the ME MUST perform the following steps:

- Read EF (DIR) to evaluate the PKCS#15 application template and find the file identifier (and path of the PKCS#15 DF),
- Select PKCS#15 DF (indirect selection), as defined in [TS151.011],
- Read ODF,
- Read DODF-bootstrap to locate the DM\_Bootstrap file,
- Read the bootstrap file

## D.3 Bootstrap data on UICC activated in 3G mode

### D.3.1 Access to the file structure

To select the PKCS#15 application, the ME:



- MUST evaluate the PKCS#15 application template – i.e. PKCS#15 AID - present in the EF (DIR),
- MUST open a logical channel using MANAGE CHANNEL command as specified in [TS102.221],
- MUST select the PKCS#15 ADF using the PKCS#15 AID as parameter of the SELECT command, using direct application selection as defined in [TS102.221].

DM\_Bootstrap file will be located under the PKCS#15 ADF.

### D.3.2 Files Overview

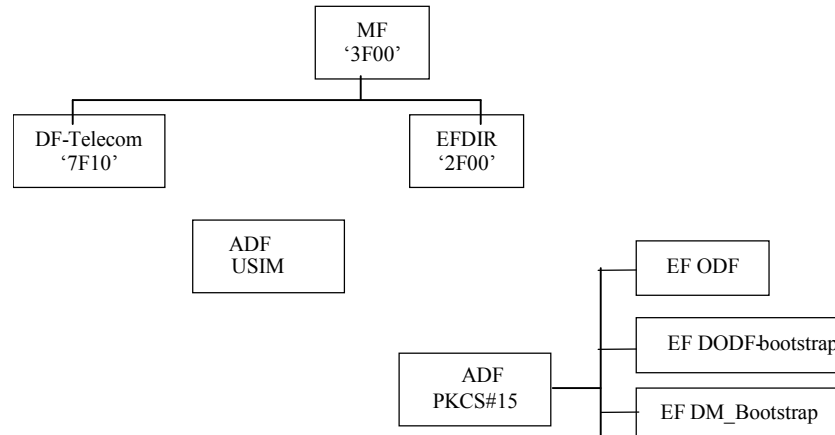


Figure 5: File structure for DM bootstrap data on 3G UICC

### D.3.3 Access Method

UICC commands Read Binary and Update Binary, as defined in [TS102 221], are used to access bootstrap data.

### D.3.4 Access Conditions

The ME is informed of the access conditions of provisioning files by evaluating the “private” and “modifiable” flags in the corresponding DODF-bootstrap files structure.

In the case where one of the above mentioned flag is set, cardholder verification is required. The ME must evaluate the PIN references that must be verified as defined in [TS102.221] i.e. evaluate the FCP

Access conditions for files are proposed in section D.4.

### D.3.5 Requirements on the 3G UICC

To support the DM smartcard bootstrap on the 3G UICC, the ME MUST perform the following steps:

- Select PKCS#15 file structure as specified in D.3.1.
- Read ODF to locate the DODF-bootstrap,
- Read DODF-bootstrap to locate the DM\_Bootstrap file,
- Read the bootstrap file

## D.4 Files Description

All files defined are binary files as defined in [TS102.221]. These files are read and updated using commands related to the application they belong to.

### D.4.1 Object Directory File, EF ODF

The mandatory Object Directory File (ODF) ([PKCS#15], section 5.5.1) contains pointers to other EFs, each one containing a directory of PKCS#15 objects of a particular class (e.g. DODF-bootstrap). The File ID is specified in [PKCS#15]. The card issuer decides the file size. The EF (ODF) can be read but it MUST NOT be modifiable by the user.

In the case of SIM or UICC, the EF (ODF) is described below:

Identifier: default 0x5031, see [PKCS#15]	Structure: Binary	Mandatory
File size: decided by the card issuer	Update activity: low	
Access Conditions:		
READ	ALW	
UPDATE	ADM	
INVALIDATE	ADM	
REHABILITATE	ADM	
Description		
See [PKCS#15]		

### D.4.2 Bootstrap Data Object Directory File, EF DODF-bootstrap

This Data Object Directory File provisioning contains directories of provisioning data objects ([PKCS#15], section 6.7) known to the PKCS#15 application.

The File ID is described in the EF (ODF). The file size depends on the number of provisioning objects stored in the smartcard. Thus, the card issuer decides the file size.

Identifier: See ODF	Structure: Binary	Mandatory
File size: decided by the card issuer	Update activity: low	

Access Conditions:	
READ	ALW
or CHV1 (SIM, See section D.2)	
or Universal / application / Local PIN (UICC, See section D.3)	
UPDATE	ADM
INVALIDATE	ADM
REHABILITATE	ADM
Description	
See hereafter and [PKCS#15]	

The EF (DODF-bootstrap) MUST contain information on provisioning objects:

- Readable label describing the provisioning document (`CommonObjectAttributes.label`). The ME could display this label to the user.
- Flags indicating whether the provisioning document is private (i.e., is protected with a PIN) and/or modifiable (`CommonObjectAttributes.flags`). The card issuer decides whether or not a file is private (it does not need to be if it does not contain any sensitive information)
- Object identifier indicating a DMbootstrap object and the type of the provisioning object (`CommonDataObjectAttributes.applicationOID`)
- Pointer to the contents of the provisioning document (`Path.path`)

The EF(DODF-bootstrap) MUST contain the types of provisioning documents (indicated using object identifiers) to be used by the ME. The Bootstrap type is described hereafter.

A dedicated OID is required and defined for each provisioning file:

- Bootstrap OID = { joint-isu-itu-t(2) identified-organizations(23) wap(43) DMbootstrap(x-oma-dm:bootstrap) DM\_Bootstrap(1) }

The ME MUST use the OID to distinguish the DODF-bootstrap from any other DODF. The EF(DODF-bootstrap) can be read but it MUST NOT be modifiable by the user.

### D.4.3 EF DM\_Bootstrap

Only the card issuer can modify EF DM\_Bootstrap

Setting all bytes to 'FF' initialises EF DM\_Bootstrap.

Identifier: See DODF	Structure: Binary	Optional
File size: decided by the card issuer	Update activity: low	
Access Conditions: READ          ALW or CHV1 (SIM, See section D.2) or Universal / application / Local PIN (UICC, See section D.3) UPDATE                ADM INVALIDATE            ADM REHABILITATE  ADM		
Description		
Contains a DM bootstrap message		

The contents of the bootstrap message are separately defined in section 5.4.