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1. Scope

This document describes a management protocol using the DM Representation Protocol [DMREPPRO]. This protocol is called the OMA Device Management Protocol, abbreviated as OMA DM Protocol, and it defines the protocol for various management procedures.
2. References

2.1 Normative References

URL: http://www.openmobilealliance.org

URL: http://www.openmobilealliance.org

URL: http://www.openmobilealliance.org

URL: http://www.openmobilealliance.org

URL: http://www.openmobilealliance.org

URL: http://www.openmobilealliance.org

URL: http://www.openmobilealliance.org

URL: http://www.ietf.org/rfc/rfc2119.txt

URL: http://www.ietf.org/rfc/rfc2396.txt

URL: http://www.ietf.org/rfc/rfc2616.txt

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.

Any reference to components of the DTD’s or XML snippets is specified in this “typeface”.

3.2 Definitions

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

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full device URI</td>
<td>Full path to a device resource specified in the device's context. It is always a URI relative to the devices’ root node. Full device URI must always be used in the present specification.</td>
</tr>
<tr>
<td>Message</td>
<td>Atomic unit in OMA DM Protocol, one packet that the bearer network is able to accept. One OMA DM Protocol package could be divided into many messages.</td>
</tr>
<tr>
<td>Package</td>
<td>Package is a conceptual set of commands that could be spread over multiple messages.</td>
</tr>
<tr>
<td>Resource</td>
<td>A network data object or service that can be identified by a URI, as defined in Hypertext Transfer Protocol [RFC2616]. Resources may be available in multiple representations (e.g. multiple languages, data formats, size, and resolutions) or vary in other ways.</td>
</tr>
</tbody>
</table>
4. Introduction

The OMA Device Management Protocol allows management commands to be executed on nodes. It uses a package format defined in the DM Representation Protocol [DMREPPRO]. A node might reflect a set of configuration parameters for a device. Actions that can be taken against this node might include reading and setting parameter keys and values. Another node might be the run-time environment for software applications on a device. Actions that can be taken against this type of node might include installing, upgrading, or uninstalling software elements.

Actions are represented by OMA Device Management Protocol Commands, which are described in Device Management Representation Protocol [DMREPPRO].
5. Node addressing

DM supports two types of node addressing – absolute URI and relative URI. DM Clients and DM Servers MUST support absolute URI addressing and SHOULD support relative URI addressing.

5.1 Absolute URI Addressing

Each node MUST be addressed by a unique full device URI. URIs MUST follow requirements specified in Uniform Resource Identifiers (URI) [RFC2396] with the restrictions as specified in OMA Device Management Tree and Descriptions [DMTND]. Node addressing is defined in [DMTND].

Each node has a type that determines what kind of management content can be set/read on that object. Operations on a certain node require a predefined type of value to be sent and when the object is read, a value of that type is returned. For example a certain node can have a simple text type (text/plain) so simple text values can be set while another node stores complex types like the WAP Provisioning document type and require that value set in that node come with the WAP Provisioning document MIME type. Examples for other objects with complex values can be WAP settings or installed software.

In OMA DM Protocol, the target and source of a command are identified by the Target and Source elements respectively. Target refers to the recipient, and Source refers to the originator. Exceptions to this approach are mentioned in management commands requiring exception.

5.2 Relative URI Addressing

In case when the DM Server doesn’t specify the absolute URI, the possibility is to address the node using relative URI as defined below. The relative URI contains two parts:

- Part A: This is used to identify the actual root URI of the Management Object that is to be managed. DM Client MUST resolve the actual path which begins from the root of Management Tree to the <x> node of the Management Object.
- Part B: This is used to identify the address of the node to be manipulated inside the Management Object, which starts after the root of the Management Object.

The syntax definition for Part A is `URI?MOID=value&attribute=value` as described below:

- URI: The start point for the DM Client to find the MO occurrences in the whole sub-tree begins from ‘URI’. This element SHOULD be included in the relative URI addressing.
- ?: This is the separator between the ‘URI’ and MOID. This element MUST be included in the relative URI addressing only when URI is present.
- MOID=value: This element is used to specify the MO Identifier which identifies the Management Object that is to be managed. This element MUST be included in the relative URI addressing. The character ‘:’ MUST be percent encoded as ‘%3A’ within MOID.
- &: This is the separator between the MOID and the attribute condition or between attribute conditions. This element MAY be included in the relative URI addressing. If this element is specified, the preceding ‘&’ MUST be specified as well. For reserved characters defined in section 3.4 “Query Component” of [RFC2396] MUST be percent encoded appropriately. If the DM Server need more attribute conditions to specify a unique MO, “&attribute=value” can occur from 0 time to N times with different attributes.

The Part A of relative URI MUST be included in the `<TargetParent>/<LocURI>` element. The Part B of relative URI MUST be included in the `<Target>/<LocURI>` element if it presents. For Add, Replace and Exec commands, the `<TargetParent>`
and `<Target>` elements MUST be included in the DM Message. For Delete command, the `<TargetParent>` element MUST be included in the DM Message, the `<Target>` element MAY be included in the DM Message.

The DM Client MUST resolve the relative URI to actual absolute URI if it supports relative URI addressing. The DM Client MUST find all the MO occurrences in the whole sub-tree according to the specified MO identifier. In case there are multiple MO occurrences found and “attribute=value” is provided by the DM Server, the DM Client MUST use the “attribute=value” to resolve the root URI of the unique MO occurrence that is to be managed.

In case the DM Server wishes to delete the whole MO occurrence(s), the Part B of relative URI is not needed. Then the Part A of relative URI will be enough to resolve the root URI(s) of the MO occurrence(s) to be removed from the Device. In this case `<Target>` element will not be included in `<Delete>` command of DM Message.

The actual URI MUST be constructed as the concatenation of resolved URI from Part A, followed by the “/” separator character, followed by the Part B of the relative URI.

There are two scenarios about how to address failure:

- **Within Normal DM Session:**
  - If the DM Client doesn’t support this feature, the DM Client MUST return status code 406 (Optional Feature Not Supported).
  - If the DM client failed to resolve the relative URI to actual absolute URI, the DM Client MUST return status code 400 (Bad Request).
  - If the DM Client failed to find the unique MO occurrence if attribute=value is provided, the DM Client MUST return Status Code 404 (Not Found).

- **Within Sessionless or Bootstrap Session:**
  - Since the response is not expected by the DM server, no status code will be returned. If the DM Client doesn’t support, or failed to resolve the URI to absolute URI, or failed to find the unique MO occurrence, the DM Client MUST NOT perform this command.

The relative URI concept is illustrated in the following diagram:

![Figure 1: Relative URI Concept](image-url)
In this example DM Server wants to manipulate node ‘/A1/E/G’. The Part A of the relative URI sent by the DM Server is “.?MOID=urn:oma:oma_example:1.0&F=Camera”. The Part B of the relative URI sent by the DM Server is “E/G”. The example message sent by DM Server is shown below:

```xml
<Exec>
  <CmdID>4</CmdID>
  <Item>
    <TargetParent>
      <LocURI>.?MOID=urn%3Aoma%3Aoma_example%3A1.0&F=Camera</LocURI>
    </TargetParent>
    <Target>
      <LocURI>E/G</LocURI>
    </Target>
  </Item>
</Exec>
```

The resolved URI from Part A is “/A1” and the Part B is “E/G”. Therefore the actual URI of node G is “/A1/E/G”. Then the DM Client is able to execute the node ‘/A1/E/G’ as expected by the DM Server.

The more complete relative URI concept is illustrated in the following diagram:

![Figure 2: Relative URI Concept](image)

In this example DM Server wants to manipulate node ‘/A1/E/H’. The Part A of the relative URI sent by the DM Server is “.?MOID=urn:oma:oma_example:1.0&F=Camera&E/G=Foo”. The Part B of the relative URI sent by the DM Server is “E/H”. The example message sent by DM Server is shown below:

```xml
<Exec>
  <CmdID>4</CmdID>
  <Item>
    <TargetParent>
      <LocURI>.?MOID=urn%3Aoma%3Aoma_example%3A1.0&F=Camera&E/G=Foo</LocURI>
    </TargetParent>
    <Target>
      <LocURI>E/H</LocURI>
    </Target>
  </Item>
</Exec>
```
The resolved URI from Part A is “./A1” and the Part B is “E/H”. Therefore the actual URI of node G is “./A1/E/H”. Then the DM Client is able to execute the node “./A1/E/H” as expected by the DM Server.
6. Multiple Messages In Package

6.1 Description

The OMA Device Management protocol provides the functionality to transfer one SyncML package using multiple DM messages. This is necessary when one SyncML package is too large to be transferred in one SyncML message. For example, this limitation may be caused by the transport protocol or by the limitations of a small footprint device.

In OMA Device Management, the role of the package as a logical grouping of items is very limited. Most restrictions occur on messages, not on packages. For example, a command must fit entirely into one message. This includes the Sequence and Atomic commands, each of which must fit entirely into one message.

In order to avoid overwhelming a client with limited resources, a server is not permitted to send new commands to a client that has not yet returned a status to previous commands. In other words, most messages sent by the server to the client will correspond to a (one message) package, except in the case where a server is sending a large object or asking for more messages (using Alert 1222). A package containing a large object datum will span as many messages as necessary to transmit the large object, as specified in Section 7.

Note that the server is always in one of the following states with respect to package boundaries:

1. The server has sent a complete package. In this state, the server is awaiting status from the client on the commands sent in the package. Because the status and results may be large, such as the result of Get commands, the client may send multiple messages back to the server before completing its response.
2. The server has received a complete package (of responses) from the client. In this state, the server may send new commands to the client.
3. The server has sent one or more messages that are part of the same package, but has not yet sent the final message of the current package. This state is only valid when the server is sending a large object, and the package will end when the last chunk of the large object is sent.

Because the underlying transports for DM messages have a request/response form, either the client or the server may be required to send a message that contains neither new commands nor a Final flag, in order to keep the request/response cycle going.

For example, when the server is in State 1 (above), it may receive many messages from the client containing Status and Results. The server will respond to each such message sent by the client, but may not include new commands in those responses. Messages sent by the server in this state will contain a Status to the SyncHdr sent by the client and also the Alert 1222 (More Messages). Status MUST BE sent in response to Alert but MUST NOT be sent in response to Results.

It is also possible for Alert 1222 to be replaced by Alert 1223 (Session Abort) if the server wishes to abort the session.

The following chart shows an example of how multiple messages can be used.
6.2 Requirements

If a DM package is transferred in multiple DM messages, the last message in the package MUST include the Final element [DMREPPRO]. Other messages belonging to the package MUST NOT include the Final element.

The Final element MUST NOT be supplied by the client to close its package until the server has sent its Final element to close the previous package. For instance, the client MUST NOT supply the Final element to close package #2 or package #4 until the server has supplied the Final element which closes the previous package (#1 or #3, respectively). This is necessary because packages #2 and #4 constitute replies to the commands in packages #1 and #3.

The recipient of a DM package containing multiple messages MUST be able to ask for more messages. This is done by sending an Alert command, with the alert code 1222, back to the sender. If there are DM commands to be sent as a response to a preceding message, i.e. Results, the Alert command with the 1222 alert code MAY be omitted.

In the situation in which the server has sent the Final flag, and the client has not yet sent its Final flag, the server MUST respond to the client with the following "Next Message" response:

The "Next Message" response contains Alert code 1222 (or 1223 to abort), status to the SyncHdr, no other commands, and no Final flag.

A server MUST send the Final flag in every message, when possible. This is not possible during the sending of a Large Object (see Section 7), or when sending the "Next Message" response.
7. Large Object Handling

The protocol provides a means to synchronize an object whose size exceeds that which can be transmitted within one message. This is achieved by splitting the object into chunks that will fit within the message and using the `<MoreData/>` element to signal to the recipient that the data item is incomplete and has further chunks to come.

Clients SHOULD support Large Objects and servers MUST support Large Objects.

On receipt of a data object with the `<MoreData/>` element, the recipient MUST respond with a status response “213 – Chunked item accepted and buffered” and, if there are no other commands to be sent, ask for the next message using the Alert 1222 mechanism defined in section 6.

On receipt of the last chunk of the data object the recipient reconstructs the data object from its constituent chunks and applies the requested command. The appropriate status MUST then be sent to the originator. A command on a chunked object MUST implicitly be treated as atomic; i.e. the recipient can only commit the object once all chunks have been successfully received and reassembled.

Data objects that fit within a single message MUST NOT be followed by the `<MoreData/>` element. Data objects that span multiple messages MUST have the `<MoreData/>` element after all chunks except the last chunk.

A new data object MUST NOT be added by a sender to any message until the previous data object has been completed. If a data object is chunked across multiple messages the chunks MUST be sent in contiguous messages. New DM commands (i.e. Add, Replace, Delete, Copy, Atomic or Sequence) or new Items MUST NOT be placed between chunks of a data object.

Meta and Item information SHOULD be repeated on each subsequent message containing chunks of the same data object. Authentication details related to the data object MAY vary between messages bearing chunks of the same data object as defined in the section 9.

Clients that support Large Object Handling MUST indicate this by having the value of the DevDetail/LrgObj flag set to "true". The `MaxObjSize` accepted by the sender MAY be included in Meta information for the message header (`SyncHdr`) sent to the other party. `MaxObjSize` information sent in Meta information for the `SyncHdr` MUST be respected by the recipient, who MUST NOT send any single object larger than this size. If `MaxObjSize` is not sent, the recipient is free to send objects of any size back to the sender.

Note that the `MaxObjSize` remains in effect for the entire DM session, unless a new value is supplied in a subsequent message. A possible reason to send a new `MaxObjSize` in a later message in the same session might be that the `MaxObjSize` of a client might depend on free memory, which can decrease as objects are created and increase as objects are deleted. The `MaxObjSize` need not be a dynamic quantity, however.

If an item is chunked across multiple messages, the `<Size>` element of the Meta information MUST be used to signal to the recipient the overall size of the data object. The `<Size>` element MUST only be specified in the first chunk of the item.

On receipt of the last chunk, the recipient must validate that the size of re-constituted chunks match the object `<Size>` supplied in the Meta information by the sender. If the size does not match then error status 424 “Size mismatch” MUST be returned. The recipient MUST NOT commit the command. The sender MAY attempt to retransmit the entire data object.

If the recipient detects a new data object or command before the previous item has been completed (by the chunk without the `<MoreData/>` Element), the recipient MUST respond with an Alert 1225 “End of Data for chunked object not received”. The Alert SHOULD contain the source and/or target information from the original command to enable the sender to identify the failed command. Note: a Status would not suffice here because there would not necessarily be a command ID to refer to. The recipient MUST NOT commit the command. The sender MAY attempt to retransmit the entire data object.
8. OMA DM Protocol packages

OMA DM Protocol consists of two parts: setup phase (authentication and device information exchange) and management phase. Management phase can be repeated as many times as the server wishes. Management sessions may start with Package 0 (the trigger). Trigger may be out-of-band depending on the environment and it is specified in DM Notification Initiated Session [DMNOTI].

The following chart depicts the two phases.

![Diagram showing the OMA DM Protocol packages]

The Management Phase consists of a number of protocol iterations. The content of the package sent from the server to the client determines whether the session must be continued or not. If the server sends management operations in a package that need responses (Status or Results) from the client, the management phase of the protocol continues with a new package from client to server containing the client’s responses to those management operations. The response package from client starts a new protocol iteration. The server can send a new management operation package and therefore initiate a new protocol iteration as many times as it wishes.

During the management phase when a package from server to client does not contain management operations or a challenge, the client will create a package containing only Status for SyncHdr as a response to the package received from server. In this case the entire response package MUST NOT be sent and the protocol ends. A server MUST send response packages to all client packages.

Processing of packages can consume unpredictable amount of time. Therefore the OMA DM Protocol does not specify any timeouts between packages.

If not enclosed by a Sequence or Atomic command, the client and server MAY freely choose the execution order of the management commands sent in the package. However, when execution order is required by the parent management command, commands MUST be executed in the order they were sent.
Client MUST NOT send any commands other than Replace command containing DevInfo or DevInfo, Results and Alert to the server.

8.1 Session Abort

8.1.1 Description

Either the client or the server may decide to abort the session at any time. Reasons for session abort may be server shutdown, client power-down, user interaction on the client, etc. In this case it is best if the aborting party sends a SESSION ABORT Alert. It is RECOMMENDED that the message also includes Status and Results of all the management commands that the aborting party executed before the abort operation.

If a recipient of a Session Abort sends a response to this message, the response is ignored.

Some cases of session aborts are not controllable, for example if the client goes out of coverage or its battery runs down. Servers and clients must be prepared for non-signalled session aborts as well. The requirements stated above are intended to reduce situations in which one party times out on a response from the other.

Implementations are possible (e.g. OBEX) in which the request/response roles of the transport binding may be reversed, i.e. the DM Client is a transport-level server, and the DM Server is a transport-level client. In this case, the recommendation in Section 8.1.1 above may not apply.

8.1.2 Requirement

Alert 1223 is used to signal an unexpected end to the device management session. The sender of the Session Abort alert MAY also include Status and Results of all the management commands that the aborting party executed before the abort operation. The sender MUST include a Final flag. A server receiving this alert SHOULD respond with a message that MUST contain status for the Alert and the SyncHdr and no new commands.

A client receiving Alert 1223 SHOULD NOT respond.

8.2 Package 0: Management Initiation Alert from server to client

Many devices cannot continuously listen for connections from a management server. Other devices simply do not wish to “open a port” (i.e. accept connections) for security reasons. However, most devices can receive unsolicited messages, sometimes called “notifications”.

A management server can use this notification capability to cause the client to initiate a connection back to the management server. OMA DM Protocol specifies several Management Initiation notification bearers. Definition of bearers and notification content can be found from [DMNOTI] specification.

Note that an identical effect to receiving a Management Initiation notification can be caused in other ways. For example, the user interface (UI) of the device may allow the user to tell the client to initiate a management session. Alternatively, the management client might initiate a session as the result of a timer expiring. A fault of some type in the device could also cause the management client to initiate a session.

8.3 Package 1: Initialization from client to server

The setup phase is virtually identical to that described in the [SYNCPRO]. The purpose of the initialization package sent by the client is:

- To send the DevInfo information (like manufacturer, model etc) to a Device Management Server as specified [DMSTDOBJ]. Client MUST send DevInfo information in the first message of management session.

- To send the DevDetail information (that is specified in [DMSTDOBJ]) to a Device Management Server, if it is requested in Package 0 message (as specified in [DMNOTI]).
• To identify the client to the server according to the rules specified in Section 9.

• To inform the server whether the management session was initiated by the server (by sending a trigger in Package 0) or by the client (like end user selecting a menu item).

• To inform the server of any optional Client generated alert, for example Generic Alert or Client Event [DMREPPRO].

The detailed requirements for the initialization package from the client to server (Package 1) are:

1. The requirements for the elements within the SyncHdr element.
   • The value of the VerDTD element MUST be ‘1.2’.
   • The value of the VerProto element MUST be ‘DM/1.3’.
   • SessionID MUST be included to indicate the ID of the management session. If the client is responding to notification, with alert code SERVER-INITIATED MGMT (1200), then SessionID MUST be same as in notification. Otherwise, the client generates a SessionID which should be unique for that client. The same SessionID MUST be used throughout the whole session.
   • MsgID MUST be used to unambiguously identify the message belonging to the management session from server to client.
   • The Target element MUST be used to identify the target server.
   • The Source element MUST be used to identify the source device.
   • The Cred element MAY be included in the authentication message from the Device Management client to Device Management server as specified in Section 9.

2. Alert MUST be sent whether the client or the server initiated the management session in the SyncBody. The requirement for the Alert command follows:
   • CmdID is REQUIRED.
   • The Data element is used to carry the management session type which can be either SERVER-INITIATED MGMT (1200) or CLIENT-INITIATED MGMT (1201).

3. The DevInfo information MUST be sent using the Replace command in the SyncBody. The requirement for the Replace command follows:
   • CmdID is REQUIRED.
   • An Item element per node found from DevInfo tree. Possible nodes in DevInfo tree are specified in [DMSTDOBJ].
   • The Source element in the Item element MUST have a value indicating URI of node.
   • The Data element is used to carry the DevInfo data.

4. The DevDetail information MUST only be sent using the Replace command in the SyncBody if requested by the DM Server. The requirement for the Replace command follows:
   • CmdID is REQUIRED.
   • An Item element per node found from DevDetail tree. Possible nodes in DevDetail tree are specified in [DMSTDOBJ].
• The Source element in the Item element MUST have a value indicating URI of node.
• The Data element is used to carry the DevDetail data.

5. Client MAY include client-generated alerts such as Client Event [DMREPPRO] or Generic Alert. The Final element MUST be used in the SyncBody for the message, which is the last in this package.

8.4 Package 2: Initialization from server to client

The purpose of the initialization package sent by the server is to:

• Identify the server to the client according to the rules specified in Section 9.
• Optionally, the server can send user interaction commands.
• Optionally to send management data and commands.
• Send status of Client Initiated Alerts if any of these was received from the client

Package 2 MAY close the management session by containing only the <Final> element (any management command, user interaction command or client authentication challenge will continue the session). Alternately, the server may send the Session Abort Alert (1223) to force the close of the session in extreme situations.

The detailed requirements for package 2 are:

o The requirements for the elements within the SyncHdr element.
  • The value of the VerDTD element MUST be '1.2'.
  • The value of the VerProto element MUST be ‘DM/1.3’ when complying with this specification.
  • SessionID MUST be included to indicate the ID of the management session.
  • MsgID MUST be used to unambiguously identify the message belonging to the management session from server to client.
  • The Target element MUST be used to identify the target device.
  • The Source element MUST be used to identify the source device.
  • Cred element MAY be included in the authentication message according to the rules described in Section 9. Server is always authenticated to the device but this authentication MAY be accomplished at the transport level.

o The Status MUST be returned in the SyncBody for the SyncHdr and Alerts sent by the client.

o Any management operation including user interaction in the DM document (e.g. Alert, Sequence, Replace) are placed into the SyncBody.
  • CmdID is REQUIRED.
  • Source MUST be used if URI is needed to further address the source dataset.
  • Target MUST be used if URI is needed to further address the target dataset.
  • The Data element inside Item is used to include the data itself unless the command does not require a Data element.
• The Meta element inside an operation or inside an Item MUST be used when the Type or Format are not the default values [META].
  
  o The Final element MUST be used in the SyncBody for the message, which is the last in this package.

8.5 Package 3: Client response sent to server

The content of package 3 is:

• Results of management actions sent from server to client.
• Results of user interaction commands.
• New optional Client generated alert, for example Generic Alert or Client Event [DMREPPRO] that was raised during the session.

This package is sent by the client if Package 2 contained management commands that required a response from the client.

The detailed requirements for package 3 are:

1. The requirements for the elements within the SyncHdr element.
   • The value of the VerDTD element MUST be ‘1.2’.
   • The value of the VerProto element MUST be ‘DM/1.3’.
   • SessionID MUST be included to indicate the ID of the management session.
   • MsgID MUST be used to unambiguously identify the message belonging to the management session from server to client.
   • The Target element MUST be used to identify the target device.
   • The Source element MUST be used to identify the source device.

2. Status MUST be returned for the SyncHdr and Alert command sent by the device management server in the SyncBody.

3. Status MUST be returned in the SyncBody for management operations sent by the server in Package 2.

4. Results MUST be returned in the SyncBody for successful Get operations sent by the server in the previous package and the following requirements apply:
   • Results MUST contain Meta element with Type and Format elements describing content of Data element, unless the Type and Format have the default values [META].
   • Items in Results MUST contain the Source element that specifies the source URI.

5. Client MAY send client generated alerts, for example Client Event [DMREPPRO] or Generic Alert.

The Final element MUST be used in the SyncBody for the message, which is the last in this package.

8.6 Package 4: Further server management operations

Package 4 is used to close the management session. If the server sends any operation in Package 4 that needs response from the client, the protocol restarts from Package 3 with a new protocol iteration. Server sends results of Client Initiated Alerts if any of these was received from the client in previous package. The detailed requirements for package 4 are:

1. The requirements for the elements within the SyncHdr element.
• The value of the VerDTD element MUST be ‘1.2’.
• The value of the VerProto element MUST be ‘DM/1.3’.
• SessionID MUST be included to indicate the ID of the management session.
• MsgID MUST be used to unambiguously identify the message belonging to the management session from server to client.
• The Target element MUST be used to identify the target device.
• The Source element MUST be used to identify the source device.

2. Status MUST be returned for the SyncHdr sent by the device management server in the SyncBody and if any Alerts were sent by the client then the server MUST send Status for these Alerts.

3. Any management operation including user interaction in the DM document (e.g. Alert, Sequence, Replace) placed into the SyncBody.
   • CmdID is REQUIRED.
   • Source MUST be used if URI is needed to further address the source dataset.
   • Target MUST be used if URI is needed to further address the target dataset.
   • The Data element inside Item is used to include the data itself unless the command does not require a Data element.
   • The Meta element inside an operation or inside an Item MUST be used when the Type or Format are not the default values [META].

The Final element MUST be used in the SyncBody for the message, which is the last in this package. Package 4 MAY close the management session by containing only the <Final> element (any management command or user interaction command will continue the session). Alternately, the server may send the Session Abort Alert (1223) to force the close of the session in extreme situations.

8.7 Generic Alert

The protocol defines a Generic Alert message for Alerts generated by the client that MAY have a relation to a Management Object. In the case of a relation to a Management Object then the Source and LocURI MUST identify the address to that Management Object.

Anytime after the Client or Server Initiated Management Alert, the client MAY send a Generic Alert message to the server. The Generic Alert message SHALL only be sent from the client to the server. After the server has received the Generic Alert the server MUST respond with the status for how the server handles all Items.

The client MAY send multiple Alert messages of code “Generic Alert” or combine them together with multiple Items inside one or multiple Alert message of code “Generic Alert”. The Data in the Generic Alert message is not specified in the protocol, the protocol will specify how the client can inform the server what Type and Format it is. The server MUST support the Generic Alert Format but not all Types of the alert data. The Server MUST respond with status 415 “Unsupported media Type or Format” if the Type and Format are unsupported by the server. If the device does not support Large Object then the Alert message MUST NOT exceed the message size.

This specification only specifies what is required from the protocol perspective, some registered Generic Alerts MAY have additional requirements for different Types of Generic Alert Data. For example, one registered Type of Alert may define that a reference to a Management Object is mandatory and the Format must be of Type Integer and the Alert Data must be included inside the Data.
The optional parameter Mark MUST contain the importance level. If the parameter is omitted then the default importance level is assumed.

The server MUST respond with status 200 “OK” or 202 “Accepted for processing” if the server has received the Alert without any errors and is capable of processing the Data in the Alert. In other cases the server MUST use one of the following error status codes: 401, 406, 407, 412, 415 or 500.

8.7.1 Generic Alert Message

This is the basic design of a Generic Alert message:

```
<Alert>
  <CmdID>2</CmdID>
  <Data>1226</Data> <!-- Generic Alert -->
  <Correlator>abc123</Correlator>
  <Item>
    <Source><LocURI>./SyncML/Sample</LocURI></Source>
    <Meta>
      <Type xmlns='syncml:metinf'>Reversed-Domain-Name: org.domain.samplealert</Type>
    </Meta>
    <Format xmlns='syncml:metinf'>xml</Format>
    <Mark xmlns='syncml:metinf'>critical</Mark> <!-- Optional -->
    <Data> <!-- Client Alert Data Goes Here -->
    </Data>
  </Item>
</Alert>
```

8.7.1.1 CmdID

This MUST be specified in the same way as all commands.

8.7.1.2 Data

This MUST be specified with the value 1226 [DMREPPRO] for Generic Alert.

8.7.1.3 Item

This is a REQUIRED parameter. Item MUST be repeated for each alert of type Generic Alert if the device will send them together inside the same Alert message.

8.7.1.4 LocURI within Source

This is an optional parameter. If the Alert is generated from a Management Object and the definition of that Management Object mandates this parameter, then it MUST be included.

8.7.1.5 Meta

The Meta element MUST be specified for the Type and Format of the Alert Data.

8.7.1.6 Type

The Type element MUST be specified and specifies the media type of the content information in the Data element. The content information for this element type MUST be a URN. If it is a MIME-type, then it MUST use “Content-Type” as namespace identifier and the content SHOULD be a registered MIME content-type. If it is a reverse domain name then the namespace identifier “Reversed-Domain-Name” MUST be specified. No other namespace identifiers than these two are allowed. The ABNF syntax for the content of reverse domain name MUST be:
8.7.1.7 Format

The Format element MUST be specified. Format MUST contain a DM identifier of the Format of the following Data element.

8.7.1.8 Mark

The Mark element MAY be specified. Mark will define the importance level of the alert message. The following levels are allowed in Generic Alert: fatal, critical, minor, warning, informational, harmless and indeterminate. There the order indicates the importance level with fatal as most important and indeterminate as least important. If the Mark element is omitted then the default importance level “informational” is assumed.

8.7.1.9 Data (inside <Item>)

The Data element MUST be specified. Data MUST use the Format and Type specified in the Meta tag.

8.7.1.10 Correlator

The Correlator is an optional field and is used when the alert is an asynchronous response to an Exec command. Typically, the Correlator field in the alert echoes the Correlator value from an Exec command and is omitted in all other instances. Registered Generic Alerts SHOULD specify how the Correlator field is used.
9. Authentication

OMA DM Protocol uses the authentication framework specified in this chapter, with extensions defined in OMA Device Management Security [DMSEC]. This section specifies the rules for how the OMA-DM Protocol-level and the transport-level authentication are used.

Server and client can both challenge each other if no credentials were given in the original request or the credentials were considered too weak. If the server sent no credentials or invalid credentials in Package #2, no challenge and no commands (only Status to SyncHdr and DevInfo), the client MUST NOT challenge the server by sending back only a Status for the SyncHdr with a challenge. If the server challenged the client in Pkg 2, the client MUST revert to pkg 1 and MUST resend the Alert and DevInfo along with the credentials requested by the server.

The preferred authentication type of the server may be indicated to the client using the <X>/AAuthPref parameter in DM Account management object [DMSTDOBJ].

Generation and maintenance of client and server credentials are out of scope of the OMA DM Protocol specification.

In this chapter, the authentication procedures are defined for the basic and MD5 digest access authentication.

9.1 Authentication Challenge

If the response code to a request (message or command) is 401 (‘Unauthorized’) or 407 (‘Authentication required’), the request requires authentication. In this case, the Status command to the request MUST include a Chal element (See [DMREPPRO]). The Chal contains a challenge applicable to the requested resource. The originator MAY repeat the request with a suitable Cred element (See [DMREPPRO]). If the request already included the Cred element, then the 401 response indicates that authorization has been refused for those credentials.

Both the client and the server can challenge for authentication.

If the 401 response (i.e., Status) contains the same challenge as the prior response, and the user agent has already attempted authentication at least once, then the user SHOULD be presented the entity that was given in the response, since that entity might include relevant diagnostic information.

If the response code to a request is 212 (‘Authentication accepted’), no further authentication is needed for the remainder of the DM session. In the case of the MD5 digest access authentication, the Chal element can however be returned. Then, the next nonce in Chal MUST used for the digest when the next DM session is started.

If a request includes security credentials and the response code to the request is 200, the same credentials MUST be sent within the next request. If the Chal element is included and the MD5 digest access authentication is mandated, a new digest is created by using the next nonce. In the case of the MD5 digest access authentication, the Chal element can however be returned. The next nonce in Chal MUST be used when the next request is sent.

Once authentication has occurred, the authentication type for a security layer MUST be kept same for the whole session.

In case of authentication failure (either the userid and/or password was wrong or authentication was mandated) requirements are:

- The response message indicating the authentication failure on application layer (see chapter 9.3) contains only Status commands (i.e. Replace, Get etc. commands MUST NOT be specified in the response). A Status command MUST be provided for every command received in the request.

- In case the session is continued, the next message containing the proper credentials MUST contain a Status for the SyncHdr, MUST have the same SessionID as the previous messages and the message MUST be sent to the RespURI, if it was specified in the response indicating the authentication failure.
9.2 Authorization

The Cred element MUST be included in requests (message or command), which are sent after receiving the 401 or 407 responses if the request is repeated. In addition, it can be sent in the first request from a device if the authentication is mandated through pre-configuration. The content of the Cred element is specified in [DMREPPRO]. The authentication type is dependent on the challenge (See the previous chapter) or the pre-configuration.

9.3 Application Layer Authentication

The authentication on the application layer is accomplished by using the Cred element in SyncHdr and the Status command associated with SyncHdr. Within the Status command, the challenge for the authentication is carried as defined earlier. The authentication can happen both directions, i.e., the client can authenticate itself to the server and the server can authenticate itself to the client.

9.4 Authentication Examples

9.4.1 Basic authentication with a challenge

At this example, the client tries to initiate with the server without any credentials (Pkg #1). The server challenges the client (Pkg #2) for the application layer authentication. The client MUST send Pkg #1 again with the credentials. The server accepts the credentials and the session is authenticated (Pkg #2). In the example, commands in SyncBody are not shown although in practice, they would be there.

Pkg #1 from Client:

```xml
<SyncML xmlns='SYNCML:SYNCML1.2'>
  <SyncHdr>
    <VerDTD>1.2</VerDTD>
    <VerProto>DM/1.3</VerProto>
    <SessionID>1</SessionID>
    <MsgID>1</MsgID>
    <Target><LocURI>http://www.syncml.org/mgmt-server</LocURI></Target>
    <Source><LocURI>IMEI:493005100592800</LocURI></Source>
  </SyncHdr>
  <SyncBody>
    ...
  </SyncBody>
</SyncML>
```

Pkg #2 from Server:

```xml
<SyncML xmlns='SYNCML:SYNCML1.2'>
  <SyncHdr>
    <VerDTD>1.2</VerDTD>
    <VerProto>DM/1.3</VerProto>
    <SessionID>1</SessionID>
    <MsgID>1</MsgID>
    <Target><LocURI>IMEI:493005100592800</LocURI></Target>
    <Source><LocURI>http://www.syncml.org/mgmt-server</LocURI></Source>
  </SyncHdr>
  <SyncBody>
    <Status>
      <CmdID>1</CmdID>
      <MsgRef>1</MsgRef>
      <CmdRef>0</CmdRef>
    </Status>
  </SyncBody>
</SyncML>
```
<Cmd>SyncHdr</Cmd>
<TargetRef>http://www.syncml.org/mgmt-server</TargetRef>
<SourceRef>IMEI:493005100592800</SourceRef>
<Chal>
  <Meta>
    <Type xmlns='syncml:metinf'>syncml:auth-basic</Type>
    <Format xmlns='syncml:metinf'>b64</Format>
  </Meta>
  <Data>407</Data> <!-- Credentials missing -->
</Chal>
</SyncBody>
</SyncML>

Pkg #1 (with credentials) from Client:

<SyncML xmlns='SYNCML:SYNCML1.2'>
  <SyncHdr>
    <VerDTD>1.2</VerDTD>
    <VerProto>DM/1.3</VerProto>
    <SessionID>1</SessionID>
    <MsgID>2</MsgID>
    <Target><LocURI>http://www.syncml.org/mgmt-server</LocURI></Target>
    <Source><LocURI>IMEI:493005100592800</LocURI></Source>
    <Cred>
      <Meta>
        <Type xmlns='syncml:metinf'>syncml:auth-basic</Type>
        <Format xmlns='syncml:metinf'>b64</Format>
      </Meta>
      <Data>QnJ1Y2UyOk9oQmVoYXZl</Data>
      <!-- base64 formatting of 'userid:password' -->
    </Cred>
  </SyncHdr>
  <SyncBody>
    ...
  </SyncBody>
</SyncML>

Pkg #2 from Server:

<SyncML xmlns='SYNCML:SYNCML1.2'>
  <SyncHdr>
    <VerDTD>1.2</VerDTD>
    <VerProto>DM/1.3</VerProto>
    <SessionID>1</SessionID>
    <MsgID>2</MsgID>
    <Target><LocURI>IMEI:493005100592800</LocURI></Target>
    <Source><LocURI>http://www.syncml.org/mgmt-server</LocURI></Source>
  </SyncHdr>
  <SyncBody>
    <Status>
      <CmdID>1</CmdID>
      <MsgRef>2</MsgRef>
      <CmdRef>0</CmdRef>
      <Cmd>SyncHdr</Cmd>
      <TargetRef>http://www.syncml.org/mgmt-server</TargetRef>
      <SourceRef>IMEI:493005100592800</SourceRef>
    </Status>
  </SyncBody>
</SyncML>
9.4.2 MD5 digest access authentication with a challenge

At this example, assume (as in 9.4.1 above) the client tries to initiate with the server without any credentials (Pkg #1 is omitted here for brevity). The server challenges the client as above (Pkg #2 is also omitted from this example) for the application layer authentication. The authentication type is now syncml:auth-md5 (MD5 digest access authentication). The client MUST resend Pkg #1 this time with the MD5 credentials (as shown below in Pkg #1). The server accepts the credentials and the session is authenticated (Pkg#2 below). Also, the server sends the next nonce to the client, which the client MUST use when the next DM session is started. In the example, commands in SyncBody are not shown although in practice, they would be there.

Pkg #1 from Client:

```
<SyncML xmlns='SYNCML:SYNCML1.2'>
  <SyncHdr>
    <VerDTD>1.2</VerDTD>
    <VerProto>DM/1.3</VerProto>
    <SessionID>1</SessionID>
    <MsgID>2</MsgID>
    <Target><LocURI>http://www.syncml.org/mgmt-server</LocURI></Target>
    <Source>
      <LocURI>IMEI:493005100592800</LocURI>
      <LocName>Bruce2</LocName> <!-- userid -->
    </Source>
    <Cred>
      <Meta>
        <Type xmlns='syncml:metinf'>syncml:auth-md5</Type>
        <Format xmlns='syncml:metinf'>b64</Format>
      </Meta>
      <Data>Zz6EivR3yeaaENcRN6lpAQ==</Data> <!-- Base64 coded MD5 for user 'Bruce2', password 'OhBehave', nonce 'Nonce' -->
    </Cred>
  </SyncHdr>
  <SyncBody>
    ...  
  </SyncBody>
</SyncML>
```

Pkg #2 from Server:

```
<SyncML xmlns='SYNCML:SYNCML1.2'>
  <SyncHdr>
    <VerDTD>1.2</VerDTD>
    <VerProto>DM/1.3</VerProto>
    <SessionID>1</SessionID>
    <MsgID>2</MsgID>
    <Target><LocURI>IMEI:493005100592800</LocURI></Target>
    <Source><LocURI>http://www.syncml.org/mgmt-server</LocURI></Source>
    ... 
  </SyncHdr>
</SyncML>
```
<SyncHdr/>
<SyncBody>
  <Status>
    <CmdID>1</CmdID>
    <MsgRef>1</MsgRef>
    <CmdRef>0</CmdRef>
    <Cmd>SyncHdr</Cmd>
    <TargetRef>http://www.syncml.org/mgmt-server</TargetRef>
    <SourceRef>IMEI:493005100592800</SourceRef>
    <Chal>
      <Meta>
        <Type xmlns='syncml:metinf'>syncml:auth-md5</Type>
        <Format xmlns='syncml:metinf'>b64</Format>
        <NextNonce xmlns='syncml:metinf'>LG3iZQhdhdmKHg==</NextNonce>
        <!-- This nonce is used at the next session -->
      </Meta>
      <Data>212</Data> <!-- Authenticated for session -->
    </Chal>
  </Status>
  ...
</SyncBody>
</SyncML>
10. User interaction commands

10.1 Introduction

The OMA Device Management Protocol specifies following user interaction types for example to notify and obtain confirmation from the user regarding the management operation. These interaction types are the following:

- User displayable notification associated with a certain action.
- Confirmation from the user to execute a certain management operation.
- Prompt user to provide input for upcoming management operation.
- Prompt user to select item or items among items.
- Display progress notification for a certain action.

10.2 User interaction alert codes

These alerts can be sent only from the server to the client. Clients MUST report 406: “Optional Feature Not Supported”, if client does not support User Interaction Alerts. If sent by the client, they are ignored by the server. Multiple user interaction alert’s can be present in Package 2, in this case the client executes them by arbitrary order (unless Sequence is used) and sends back the results in multiple Status packages in Package 3. If the protocol continues after Package 4, Package 4 can also contain user interaction alert’s.

When a user interaction is executed, server is notified about the outcome of the interaction in a Status message. The user interaction-specific Status responses are described in [DMREPPRO].

All user interaction alerts contain two or more Item elements. Client MUST preserve the order of these Item elements. Client MUST also process these Item elements in the same order as they are in the message.

User interactions, except display, SHOULD have user option to cancel operation. If the user decides to cancel the operation, then management message processing is stopped. Status codes for executed commands are reported normally and status code (215) Not executed is returned to all commands which are not processed. After processing the user response the server might decide to continue protocol with some other management operation.

If the UI allows the user to cancel (for any of the UI Alerts), then the status (214) Operation cancelled should be returned for the Alert.

10.2.1 Display

The DM DISPLAY Alert is slightly changed in OMA DM Protocol. The Alert has two Items.

- The first Item contains optional parameters as specified in Section 10.3.
- The second Item has exactly one Data element containing the text to be displayed to the user.

Example:

```
<Alert>
  <CmdID>2</CmdID>
  <Data>1100</Data>
  <Item><Data>MINDT=10</Data></Item>
  <Item><Data>Management in progress</Data></Item>
</Alert>
```
10.2.2 Confirmation

Confirmation is a binary decision: the user either approves or rejects the option. A new Alert code is introduced for this purpose, the CONFIRM_OR_REJECT. When the client receives this Alert, it displays the Alert text then enables the user to select "Yes" or "No". If the answer is "Yes", the status code 200: "Yes" is returned and the processing of the package continues without change in processing. If the answer is "No", the status code 304: "No" is returned and the processing of the package ceases. If the UI allows the user to cancel, status 214: “Operation cancelled” should be returned for the Alert.

If user answers "No", then package processing will change according to placement of confirmation Alert in package as follows.

- If confirmation Alert is inside Atomic, then Atomic fails and all executed commands have to be rolled back.
- If confirmation Alert is inside Sequence, then commands in Sequence after confirmation Alert are bypassed.
- If confirmation Alert is not inside Atomic or Sequence i.e. it is directly in SyncBody, then user response has no effect to package processing. In this way server can query user opinion before sending actual management commands to client device.

Status code (215) Not Executed will be sent back for the commands whose execution was bypassed as result of user interaction.

The Alert contains two Items.

- The first Item contains the optional parameters as specified in Section 10.3.
- The second Item has exactly one Data element containing the text to be displayed to the user.

Example:

```xml
<Alert>
  <CmdID>2</CmdID>
  <Data>1101</Data>
  <Item></Item> <!-- no optional parameters -->
  <Item>
    <Data>Do you want to add the CNN access point?</Data>
  </Item>
</Alert>
```

Result if user responds "No":

```xml
<Status>
  <CmdID>2</CmdID>
  <MsgRef>1</MsgRef>
  <CmdRef>2</CmdRef>
  <Cmd>Alert</Cmd>
  <Data>304</Data> <!-- Not modified -->
</Status>
```

If the result in the above example had been that the user chose Yes, the status would have been (200).

10.2.3 User input

When this Alert is sent, the client displays the text then allows the user to type in a text string. This text string is then sent back to the server in a Status message.
The server instructs the client to execute this user interaction by sending a **TEXT INPUT Alert**. The **Alert** contains at least two **Items**.

- The first **Item** contains optional parameters as specified in Section 10.3.
- The second **Item** has exactly one **Data** element containing the text to be displayed to the user.

Example:

```xml
<Alert>
  <CmdID>2</CmdID>
  <Data>1102</Data>
  <Item></Item>
  <Item>
    <Data>Type in the name of the service you would like to configure</Data>
  </Item>
</Alert>
```

The user is presented with the text and an input box to type in the message. The following **Status** message is sent back in the next message from client to server:

```xml
<Status>
  <MsgRef>1</MsgRef>
  <CmdRef>2</CmdRef>
  <Cmd>Alert</Cmd>
  <Data>200</Data> <!-- Successful, user typed in a text -->
  <Item>
    <Data>CNN</Data> <!-- User input -->
  </Item>
</Status>
```

### 10.2.4 User choice

When this **Alert** is sent, the user is presented with a set of possible choices. The **Alert** body MUST contain the following **Items**.

- The first **Item** contains optional parameters as specified in Section 10.3.
- The second **Item** has exactly one **Data** element containing the title of the selection as plain text.
- From third **Item** onwards the **Item** contains exactly one **Data** element that describes one possible choice as plain text. These **Items** are referenced by a number starting from 1. **Items** MUST be numbered in the order they were sent. **Items** SHOULD be presented to the user in the order they were sent.

The user selection is returned in **Status** message. The selected item is returned in an **Item**. The **Data** element of this **Item** contains the reference number of item. A variation of this **Alert** allows the user to select multiple items. In this case selected items are sent back in multiple **Items** in the same way as one selected item.

One possible implementation could be a list and each **Data** member of the **Alert** could be displayed as a row in the list. The user could select a list item then he or she would push the "Ok" button and the ID of the selected list item is sent back in a **Status** message.

Example for a single-choice **Alert**:

```xml
<Alert>
  <CmdID>2</CmdID>
  <Data>1102</Data>
  <Item></Item>
  <Item>
    <Data>Type in the name of the service you would like to configure</Data>
  </Item>
</Alert>
```
Response to this Alert returns the selected item.

```xml
<Status>
  <MsgRef>1</MsgRef>
  <CmdRef>2</CmdRef>
  <Cmd>Alert</Cmd>
  <Data>200</Data> <!-- Successful, user selected an item -->
  <Item>
    <Data>2</Data> <!-- User selected MobilBank -->
  </Item>
</Status>
```

Example to multiple-choice Alert

```xml
<Alert>
  <CmdID>2</CmdID>
  <Data>1104</Data>
  <Item></Item>
  <Item><Data>Select service to configure</Data></Item>
  <Item>
    <Data>CNN</Data>
  </Item>
  <Item>
    <Data>Mobilbank</Data>
  </Item>
  <Item>
    <Data>Game Channel</Data>
  </Item>
</Alert>
```

Response to this Alert returns the selected item. The number of the selected items can be returned in arbitrary order by the client.

```xml
<Status>
  <MsgRef>1</MsgRef>
  <CmdRef>2</CmdRef>
  <Cmd>Alert</Cmd>
</Status>
```
10.2.5 Progress notification (object download)

Users SHOULD be able to track the progress of a longer management operation like a file or object download. OMA Device Management Protocol will not provide a separate mechanism for progress notification but it will entirely reuse the DM Size Meta-Information tag defined in DM Meta-Information DTD [META] and will make a recommendation for device manufacturers to use this tag for displaying progress notification.

According to DM Meta-Information DTD, any Item can be tagged by Size meta-information that indicates the size of the object. When the device encounters a Size meta-information tag in a received Item, it MAY display a progress notification on the user interface if the device decides that the item with the given size will take a longer time to download. The progress notification bar is scaled according to the length information conveyed in the Size element. If the size information is not sent by the server, the client is not able to display a scaled progress bar so it is recommended that servers send this information if the object to be downloaded by the client is reasonably large.

Example of an antivirus data file download with Size Meta Information.

```
<Add>
  <CmdID>2</CmdID>
  <Meta>
    <Format xmlns='syncml:metinf'>b64</Format>
    <Type xmlns='syncml:metinf'>application/antivirus-inc.virusdef</Type>
  </Meta>
  <Item>
    <Meta><!-- Size of the data item to download -->
      <Size xmlns='syncml:metinf'>37214</Size>
    </Meta>
    <Target><LocURI>./antivirus_data</LocURI></Target>
    <Data><!-- Base64-coded antivirus file -->
    </Data>
  </Item>
</Add>
```

Progress indicator will be displayed during the execution of the Add command and it will be scaled so that the total length of data to be downloaded is supposed to be 37214 bytes.

10.3 User interaction options

Alert’s MAY have optional User interaction parameters in the first Item. Optional parameters are represented as one text string inside the Data element. If the User interaction Alert does not have optional parameters, the first Item is empty. The optional parameter string conforms to the URL encoding format specified in [RFC2396].

The following example uses two optional parameters:
The client MUST skip without error message all the optional parameters that it is not able to process.

The following optional parameters are currently defined.

10.3.1 MINDT (Minimum Display Time)

This parameter is a hint to the user agent of the minimum time that the user interaction should be displayed to the user. This can be important to guarantee that a notification message is readable.

MINDT parameter MUST have a value that can be evaluated as a positive, integer number. Value of MINDT is interpreted as notification display time to user in seconds.

Example:

```
<!-- Display this message for at least 10 seconds -->
<Item><Data>MINDT=10</Data></Item>
```

10.3.2 MAXDT (Maximum Display Time)

This parameter is a hint to the user agent for how long the client should wait for the user to execute the user interaction. If the user does not act within MAXDT time, the action is considered to be cancelled and a timeout status package or default response package is sent back to the server.

MAXDT parameter MUST have a value that can be evaluated as a positive, integer number. Value of MAXDT is interpreted as seconds to wait for user action.

Example:

```
<!-- Wait maximum 20 seconds for the user -->
<Item><Data>MAXDT=20</Data></Item>
```

10.3.3 DR (Default Response)

DR optional parameter specifies the initial state of the user interaction control widget. Other than setting the initial state of the user interaction control widget, DR has no other influence on the user interaction control widget. Interpretation for different user interaction types is the following:

- If the user interaction is Notification, this optional parameter is ignored.

- If the user interaction is a confirmation, 0 means that the reject user interface element is highlighted by default. 1 means that the accept user interface element is highlighted by default. Highlighted user interface element means that the "default" user interaction (like pressing Enter button) will select the highlighted user interface element. If the client user interface has no notion of highlighted user interface element, this parameter MAY be ignored.

- If the user interaction is user input, DR value specifies the original text in the text input user interface element. This text MUST conform to the optional parameter syntax rules.

- If the user interaction is single-choice, the DR value is the originally highlighted choice item; e.g. value between 1 and the number of items in the selection list.

- If the user interaction is a multi-choice, the DR value is a minus sign-separated list of originally highlighted values (for example: 2-3).

Examples:
10.3.4 MAXLEN (Maximum length of user input)

MAXLEN value is evaluated to a positive integer and determines the maximum number of characters that can be typed into the text input user interaction widget. The optional parameter MUST be ignored in all other kind of user interaction widget. If the specified maximum length of input string exceeds the capability of the client, the client MAY ignore the parameter.

Example:

<!-- Maximum string length is 30 -->
<Item><Data>MAXLEN=30</Data></Item>

10.3.5 IT (Input Type)

IT specifies what kind of characters is allowed in the text input user interaction widget. Based on this information a client with limited keyboard MAY display user interaction elements that allow easy input of characters not present on the keyboard. The optional parameter MUST be ignored in user interaction widgets other than text input. Allowed values:

IT=A - Alphanumeric input, client SHOULD allow input of all alphanumeric characters. This is the default behaviour.

IT=N - Numeric input, client SHOULD allow input of all numeric characters, decimal point and sign character.

IT=D - Date input, client SHOULD allow input of all numeric characters. User input is delivered to server in following text string format "DDMMYYYY", where;

- DD is day with possible leading zero.
- MM is month with possible leading zero.
- YYYY is year presented with four digits.

IT=T - Time input, client SHOULD allow input of all numeric characters. User input is delivered to server in following text string format "hhmmss", where;

- hh is hours with possible leading zero.
- mm is minutes with possible leading zero.
- ss is seconds with possible leading zero.

IT=P - Phone number input, client SHOULD allow input of all numeric characters, "+", "p", "w" and "s". "+" MUST be first if present in phone number.
IT=I - IP address input, client SHOULD allow input of all numeric characters. User input is delivered to server in following text string format "xxx.yyy.zzz.www"

Example:

```xml
<!-- Numeric text input -->
<Item><Data>IT=N</Data></Item>
```

Status message delivered to server as response

```xml
<Status>
  <MsgRef>1</MsgRef>
  <CmdRef>2</CmdRef>
  <Cmd>Alert</Cmd>
  <Data>200</Data> <!-- Successful, entered a number -->
  <Item>
    <Data>-1.23</Data>
  </Item>
</Status>
```

10.3.6 ET (Echo Type)

ET specifies how text input user interaction widget echoes the characters that the user types in. The optional parameter MUST be ignored in user interaction widgets other than text input. Allowed values:

ET=T - Text input. The client SHOULD allow the user to see the character the user typed into the text input user interaction widget. This is the default behaviour.

ET=P - Password input. The client SHOULD hide the character the user typed into the text input user interaction widget. One way of doing it MAY be writing an asterisk instead of the character itself.

Example:

```xml
<!-- Numeric text input -->
<Item><Data>ET=T</Data></Item>
```
11. Protocol examples

In this section several protocol scenarios will be demonstrated.

11.1 One-step protocol initiated by the server

In this section an example is presented in which a WAP connectivity context is added to the WAP settings. The user is asked to confirm whether the settings could be added.

11.1.1 Package 1: Initialization from client to server

```xml
<SyncML xmlns='SYNCML:SYNCML1.2'>
  <SyncHdr>
    <VerDTD>1.2</VerDTD>
    <VerProto>DM/1.3</VerProto>
    <SessionID>1</SessionID>
    <MsgID>1</MsgID>
    <Target>
      <LocURI>http://www.syncml.org/mgmt-server</LocURI>
    </Target>
    <Source>
      <LocURI>IMEI:493005100592800</LocURI>
    </Source>
    <Cred> <!-- Client credentials are mandatory if the transport layer is not providing authentication -->
      <Meta>
        <Type xmlns='syncml:metinf'>syncml:auth-basic</Type>
        <Format xmlns='syncml:metinf'>b64</Format>
      </Meta>
    </Cred>
    <Meta> <!-- Maximum message size for the client -->
      <MaxMsgSize xmlns='syncml:metinf'>5000</MaxMsgSize>
    </Meta>
  </SyncHdr>
  <SyncBody>
    <Alert>
      <CmdID>1</CmdID>
      <Data>1200</Data> <!-- Server-initiated session -->
    </Alert>
    <Replace>
      <CmdID>3</CmdID>
      <Item>
        <Source><LocURI>./DevInfo/DevId</LocURI></Source>
        <Meta>
          <Format xmlns='syncml:metinf'>chr</Format>
          <Type xmlns='syncml:metinf'>text/plain</Type>
        </Meta>
        <Data>IMEI:493005100592800</Data>
      </Item>
      <Item>
        <Source><LocURI>./DevInfo/Man</LocURI></Source>
        <Meta>
          <Format xmlns='syncml:metinf'>chr</Format>
          <Type xmlns='syncml:metinf'>text/plain</Type>
        </Meta>
        <Data>
        </Data>
      </Item>
    </Replace>
  </SyncBody>
</SyncML>
```
11.1.2 Package 2: Initialization from server to client

```xml
<SyncML xmlns='SYNCML:SYNCML1.2'>
  <SyncHdr>
    <VerDTD>1.2</VerDTD>
    <VerProto>DM/1.3</VerProto>
    <SessionID>1</SessionID>
    <MsgID>1</MsgID>
    <Target>
      <LocURI>IMEI:493005100592800</LocURI>
    </Target>
    <Source>
      <LocURI>http://www.syncml.org/mgmt-server</LocURI>
    </Source>
    <Cred> <!-- Server credentials -->
      <Meta>
        <Type xmlns='syncml:metinf'>syncml:auth-basic</Type>
        <Format xmlns='syncml:metinf'>b64</Format>
      </Meta>
      <Data>!-- base64 formatting of userid:password --></Data>
    </Cred>
  </SyncHdr>
  <SyncBody>
    <Status>
      <!-- Status response -->
    </Status>
  </SyncBody>
</SyncML>
```
11.1.3 Package 3: Client response

```
<SyncML xmlns='SYNCML:SYNCML1.2'>
  <Hdr>
    <VerDTD>1.2</VerDTD>
  </Hdr>
```

11.1.4 Package 4: Acknowledgement of client status

This package is now empty as no actions are sent and client does not continue the protocol.
11.2 Two-step protocol initiated by the server

Operator initiates a regular antivirus software update on PDA clients. The server checks the installed version in the first management section then updates the antivirus data in the second step.

11.2.1 Package 1: Initialization from client to server

```xml
<SyncML xmlns='SYNCML:SYNCML1.2'>
  <SyncHdr>
    <VerDTD>1.2</VerDTD>
    <VerProto>DM/1.3</VerProto>
    <SessionID>1</SessionID>
    <MsgID>1</MsgID>
    <Target>
      <LocURI>http://www.syncml.org/mgmt-server</LocURI>
    </Target>
    <Source>
      <LocURI>IMEI:493005100592800</LocURI>
    </Source>
    <Cred> <!-- Client credentials are optional -->
      <Type xmlns='syncml:metinf'>syncml:auth-basic</Type>
      <Format xmlns='syncml:metinf'>b64</Format>
      <Data><!-- base64 formatting of userid:password --></Data>
    </Cred>
    <Meta><!-- Maximum message size for the client -->
      <MaxMsgSize xmlns='syncml:metinf'>5000</MaxMsgSize>
    </Meta>
  </SyncHdr>
  <SyncBody>
    <Alert>
      <CmdID>1</CmdID>
      <Data>1200</Data> <!-- Server-initiated session -->
    </Alert>
    <Replace>
  </SyncBody>
</SyncML>
```
11.2.2 Package 2: Initialization from server to client

```
<SyncML xmlns="SYNCML:SYNCML1.2">
  <SyncHdr>
    <VerDTD>1.2</VerDTD>
    <VerProto>DM/1.3</VerProto>
    <SessionID>1</SessionID>
    <MsgID>1</MsgID>
    <Target>
      <LocURI>IMEI:493005100592800</LocURI>
    </Target>
  </SyncHdr>
  <CmdID>3</CmdID>
  <Item>
    <Source><LocURI>./DevInfo/DevId</LocURI></Source>
    <Meta>
      <Format xmlns='syncml:metinf'>chr</Format>
      <Type xmlns='syncml:metinf'>text/plain</Type>
    </Meta>
    <Data>IMEI:493005100592800</Data>
  </Item>
  <Item>
    <Source><LocURI>./DevInfo/Man</LocURI></Source>
    <Meta>
      <Format xmlns='syncml:metinf'>chr</Format>
      <Type xmlns='syncml:metinf'>text/plain</Type>
    </Meta>
    <Data>Device Factory, Inc.</Data>
  </Item>
  <Item>
    <Source><LocURI>./DevInfo/Mod</LocURI></Source>
    <Meta>
      <Format xmlns='syncml:metinf'>chr</Format>
      <Type xmlns='syncml:metinf'>text/plain</Type>
    </Meta>
    <Data>SmartPhone2000</Data>
  </Item>
  <Item>
    <Source><LocURI>./DevInfo/DmV</LocURI></Source>
    <Meta>
      <Format xmlns='syncml:metinf'>chr</Format>
      <Type xmlns='syncml:metinf'>text/plain</Type>
    </Meta>
    <Data>1.0.0.1</Data>
  </Item>
  <Item>
    <Source><LocURI>./DevInfo/Lang</LocURI></Source>
    <Meta>
      <Format xmlns='syncml:metinf'>chr</Format>
      <Type xmlns='syncml:metinf'>text/plain</Type>
    </Meta>
    <Data>US-en</Data>
  </Item>
</SyncBody>
</SyncML>
```
11.2.3 Package 3: Client response

```xml
<SyncML xmlns='SYNCML:SYNCML1.2'>
  <SyncHdr>
    <VerDTD>1.2</VerDTD>
    <VerProto>DM/1.3</VerProto>
    <SessionID>1</SessionID>
    <MsgID>2</MsgID>
    <Target>
      <LocURI>http://www.syncml.org/mgmt-server</LocURI>
    </Target>
    <Source>
      <LocURI>IMEI:493005100592800</LocURI>
    </Source>
  </SyncHdr>
  <SyncBody>
    <Status>
      <MsgRef>1</MsgRef>
      <CmdID>1</CmdID>
      <Cmd>SyncHdr</Cmd>
      <Data>212</Data>
    </Status>
    <Status>
      <MsgRef>1</MsgRef>
      <CmdID>2</CmdID>
      <Cmd>Alert</Cmd>
      <Data>200</Data><!-- User notification OK -->
    </Status>
    <Status>
      <MsgRef>1</MsgRef>
      <CmdID>4</CmdID>
      <Cmd>Get</Cmd>
      <TargetRef>./antivirus_data/version</TargetRef>
      <Data>200</Data><!-- Get OK -->
    </Status>
    <!-- Results for the Get: antivirus version number -->
    <Results>
      <Item>
        <Source>
          <LocURI>./antivirus_data/version</LocURI>
        </Source>
        <Data>antivirus-inc/20010522b/5</Data>
      </Item>
    </Results>
    <Final/>
  </SyncBody>
</SyncML>
```

11.2.4 Package 4: Continue with management operations

```xml
<SyncML xmlns='SYNCML:SYNCML1.2'>
  <SyncHdr>
```

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11.2.5 Restart protocol iteration with Package 3: Client response
11.2.6 Package 4: Finish the protocol, no continuation

```
<SyncML xmlns='SYNCML:SYNCML1.2'>
  <SyncHdr>
    <VerDTD>1.2</VerDTD>
    <VerProto>DM/1.3</VerProto>
    <SessionID>1</SessionID>
    <MsgID>3</MsgID>
    <Target>
      <LocURI>IMEI:493005100592800</LocURI>
    </Target>
    <Source>
      <LocURI>http://www.syncml.org/mgmt-server</LocURI>
    </Source>
  </SyncHdr>
  <SyncBody>
    <Status>
      <MsgRef>3</MsgRef>
      <CmdID>1</CmdID>
      <CmdRef>0</CmdRef>
      <Cmd>SyncHdr</Cmd>
      <Data>200</Data>
    </Status>
    <Final/>
  </SyncBody>
</SyncML>
```
12. Backward Compatibility

DM Servers MUST be compatible with all older minor and the same versions of the DM protocol. DM Clients MUST be compatible with the same version of the DM protocol and MAY be compatible with older versions of the DM protocol.

For example, a DM Server version 1.3 will have to be able to manage DM 1.1, DM 1.2 and DM 1.3 Clients. A DM Server version 1.2 will have to be able to manage DM 1.1 and DM 1.2 Clients.
Appendix A. Change History (Informative)

A.1 Approved Version History

<table>
<thead>
<tr>
<th>Reference</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
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<tr>
<td>N/A</td>
<td>N/A</td>
<td>No prior 1.3 version</td>
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</table>

A.2 Draft/Candidate Version 1.3 History

<table>
<thead>
<tr>
<th>Document Identifier</th>
<th>Date</th>
<th>Sections</th>
<th>Description</th>
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<tbody>
<tr>
<td>Draft Versions</td>
<td>15 Oct 2008</td>
<td>All</td>
<td>Baseline to v1.3 using OMA-TS-DM_Protocol-V1_2_1-20080617-A.</td>
</tr>
<tr>
<td></td>
<td>29 Dec 2009</td>
<td>All</td>
<td>Fixed clerical errors, spelling mistakes, etc.</td>
</tr>
<tr>
<td></td>
<td>11 Feb 2010</td>
<td>All</td>
<td>Editorial clean-up of formatting</td>
</tr>
<tr>
<td></td>
<td>23 Apr 2010</td>
<td>All</td>
<td>Editorial cleanup.</td>
</tr>
<tr>
<td></td>
<td>26 Apr 2010</td>
<td>T.O.C</td>
<td>Update of T.O.C (figures)</td>
</tr>
<tr>
<td></td>
<td>04 May 2010</td>
<td>3.1, 10.2, 10.2.5, 10.3.5, 11.2.1, 11.2.4</td>
<td>3.1, 10.2 and 10.3.5: grammatical correction Double quotes changed to single quotes</td>
</tr>
<tr>
<td></td>
<td>05 May 2010</td>
<td>All</td>
<td>Formatting of bullets Formatting of note Double quotes changed to single quotes Snippets font changed from Courier to Courier New to harmonize the snippets fonts</td>
</tr>
<tr>
<td>Candidate Version</td>
<td>25 May 2010</td>
<td>N/A</td>
<td>Status changed to Candidate by TP Ref# OMA-TP-2010-0221-INP_DM_V1.3_ERP_and_ETR_for_Candidate_approval</td>
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</table>
Appendix B. Static Conformance Requirements (Normative)

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

### B.1 SCR for DM Client

<table>
<thead>
<tr>
<th>Item</th>
<th>Function</th>
<th>Reference</th>
<th>Status</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM-PRO-C-001</td>
<td>Support of Session Setup Phase</td>
<td>8</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-C-002</td>
<td>Support of Session Abort</td>
<td>8.1</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-C-003</td>
<td>Support of Multiple Messages</td>
<td>6</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-C-005</td>
<td>Support of Management Phase</td>
<td>8</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-C-006</td>
<td>Support for executing Management Commands</td>
<td>8</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-C-007</td>
<td>Executing User Interaction Commands</td>
<td>10</td>
<td>O</td>
<td>(DM-PRO-UI-C-001 OR DM-PRO-UI-C-002 OR DM-PRO-UI-C-003 OR DM-PRO-UI-C-004 OR DM-PRO-UI-C-005) AND DM-PRO-UI-C-006</td>
</tr>
<tr>
<td>DM-PRO-C-008</td>
<td>Support for sending Status and Result after receiving Management Operations</td>
<td>8.4</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-C-009</td>
<td>Support for standard SyncML command Format and Status and Result reporting</td>
<td>8</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-C-010</td>
<td>Support for sending asynchronous data via client initiated Alerts</td>
<td>8.3</td>
<td>O</td>
<td>DM-PRO-GAlert-C-001 OR DM-PRO-GAlert-C-002</td>
</tr>
<tr>
<td>DM-PRO-C-011</td>
<td>Sending Generic Alert</td>
<td>8.7</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-C-012</td>
<td>Support Relative URI Addressing Mechanism</td>
<td>5.2</td>
<td>O</td>
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</tr>
</tbody>
</table>

### B.1.1 SCR for DM Session Setup Phase

<table>
<thead>
<tr>
<th>Item</th>
<th>Function</th>
<th>Reference</th>
<th>Status</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM-PRO-Session-C-001</td>
<td>Support Server Notification</td>
<td>8</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-Session-C-002</td>
<td>Sending Client Initiation and Device Info (Package #1) including Final element</td>
<td>8.3</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-Session-C-003</td>
<td>Sending Alert in the management session with data being either Client-Initiated 1201 or Server-Initiated 1200</td>
<td>8.3</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-Session-C-004</td>
<td>Sending Device Info in Replace</td>
<td>8.3</td>
<td>M</td>
<td></td>
</tr>
</tbody>
</table>
### B.1.2 SCR for Session Abort

<table>
<thead>
<tr>
<th>Item</th>
<th>Function</th>
<th>Reference</th>
<th>Status</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM-PRO-Abort-C-001</td>
<td>Sending Session Abort Alert</td>
<td>8.1</td>
<td>O</td>
<td>DM-PRO-Abort-C-004 AND DM-PRO-Abort-C-005</td>
</tr>
<tr>
<td>DM-PRO-Abort-C-002</td>
<td>Receiving Session Abort Alert</td>
<td>8.1</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-Abort-C-003</td>
<td>Session Abort message includes Status and Results of executed commands</td>
<td>8.1.2</td>
<td>O</td>
<td>DM-PRO-Abort-C-001</td>
</tr>
<tr>
<td>DM-PRO-Abort-C-004</td>
<td>Include Final in Message</td>
<td>8.1.2</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-Abort-C-005</td>
<td>Sender of Abort discards the response if response is received</td>
<td>8.1.1</td>
<td>O</td>
<td></td>
</tr>
</tbody>
</table>

### B.1.3 SCR for Multiple Messages

<table>
<thead>
<tr>
<th>Item</th>
<th>Function</th>
<th>Reference</th>
<th>Status</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM-PRO-Mul-C-001</td>
<td>Last message within multiple messages must contain Final</td>
<td>6.2</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-Mul-C-002</td>
<td>If message that is not the last one within Multiple Messages then the Next Message or Abort Alert must be sent</td>
<td>6.2</td>
<td>M</td>
<td></td>
</tr>
</tbody>
</table>

### B.1.4 SCR for Large Object

<table>
<thead>
<tr>
<th>Item</th>
<th>Function</th>
<th>Reference</th>
<th>Status</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM-PRO-LO-C-002</td>
<td>Respond with Status 213 when a data chunk that is not the last one is received</td>
<td>7</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-LO-C-003</td>
<td>Management Commands inside Large Object are handled as Atomic</td>
<td>7</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-LO-C-004</td>
<td>While sending data chunks all chunks except the last one must include “MoreData”</td>
<td>7</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-LO-C-005</td>
<td>Data chunks must be sent in contiguous order without any new commands</td>
<td>7</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-LO-C-006</td>
<td>Data that fits into a single message</td>
<td>7</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>Item</td>
<td>Function</td>
<td>Reference</td>
<td>Status</td>
<td>Requirement</td>
</tr>
<tr>
<td>---------------</td>
<td>---------------------------------------------------------------------------</td>
<td>-----------</td>
<td>--------</td>
<td>-------------</td>
</tr>
<tr>
<td>DM-PRO-LO-C-007</td>
<td>Sending MaxObjSize to indicate size limitations for Package</td>
<td>7</td>
<td>O</td>
<td>DM-PRO-C-004</td>
</tr>
<tr>
<td>DM-PRO-LO-C-008</td>
<td>Never create packages bigger than the size the Server indicated in MaxObjSize</td>
<td>7</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-LO-C-009</td>
<td>Include Size in first data chunk</td>
<td>7</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-LO-C-010</td>
<td>Compare actual size and the Size value and report if not equal</td>
<td>7</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-LO-C-011</td>
<td>Indicate support for Large Object in DevDetail</td>
<td>7</td>
<td>M</td>
<td></td>
</tr>
</tbody>
</table>

**B.1.5 SCR for User Interaction Commands**

<table>
<thead>
<tr>
<th>Item</th>
<th>Function</th>
<th>Reference</th>
<th>Status</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM-PRO-UI-C-001</td>
<td>Executing Display Alert</td>
<td>10.2.1</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-UI-C-002</td>
<td>Executing Confirm or Reject Alert</td>
<td>10.2.2</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-UI-C-003</td>
<td>Executing Text Input Alert</td>
<td>10.2.3</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-UI-C-004</td>
<td>Executing Single Choice Alert</td>
<td>10.2.4</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-UI-C-005</td>
<td>Executing Multiple Choice Alert</td>
<td>10.2.4</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-UI-C-006</td>
<td>Order of the Items MUST be used in the same order as in the DM message</td>
<td>10.2</td>
<td>O</td>
<td></td>
</tr>
</tbody>
</table>

**B.1.6 SCR for Generic Alert**

<table>
<thead>
<tr>
<th>Item</th>
<th>Function</th>
<th>Reference</th>
<th>Status</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM-PRO-GAlert-C-001</td>
<td>The Generic Alert has a relation to a Management Object</td>
<td>8.7</td>
<td>O</td>
<td>DM-PRO-GAlert-C-003</td>
</tr>
<tr>
<td>DM-PRO-GAlert-C-002</td>
<td>The Generic Alert does not have a relation to a Management Object</td>
<td>8.7</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-GAlert-C-003</td>
<td>LocURI must reference the address to the corresponding Management Object</td>
<td>8.7</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-GAlert-C-004</td>
<td>Support for Correlator</td>
<td>8.7.1.10</td>
<td>O</td>
<td>DM-PRO-C-011</td>
</tr>
<tr>
<td>DM-PRO-GAlert-C-005</td>
<td>Type must be included and it is RECOMMENDED to include URN or registered MIME-type as Type</td>
<td>8.7.1.6</td>
<td>O</td>
<td>DM-PRO-C-011</td>
</tr>
<tr>
<td>DM-PRO-GAlert-C-006</td>
<td>Support for importance level, Mark</td>
<td>8.7.1.8</td>
<td>O</td>
<td>DM-PRO-C-011</td>
</tr>
</tbody>
</table>

**B.2 SCR for DM Server**

<table>
<thead>
<tr>
<th>Item</th>
<th>Function</th>
<th>Reference</th>
<th>Status</th>
<th>Requirement</th>
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</thead>
<tbody>
<tr>
<td>DM-PRO-S-001</td>
<td>Support of Session Setup Phase</td>
<td>8</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-S-002</td>
<td>Support of Session Abort</td>
<td>8.1</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-S-003</td>
<td>Support of Multiple Messages</td>
<td>6</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-S-004</td>
<td>Support of Large Object Handling</td>
<td>7</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-S-005</td>
<td>Support of Management Phase</td>
<td>8</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>Item</td>
<td>Function</td>
<td>Reference</td>
<td>Status</td>
<td>Requirement</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------------------------------------</td>
<td>-----------</td>
<td>--------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>DM-PRO-S-006</td>
<td>Support for sending Management Commands</td>
<td>8</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-S-008</td>
<td>Support for sending Status and Results on Client Commands and Alerts</td>
<td>8</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-S-009</td>
<td>Support of Generic Alert</td>
<td>8.7</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-S-010</td>
<td>Support application layer authentication</td>
<td>9</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-S-011</td>
<td>Support Relative URI Addressing Mechanism</td>
<td>5.2</td>
<td>O</td>
<td></td>
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</tbody>
</table>

### B.2.1 SCR for DM Session Setup Phase

<table>
<thead>
<tr>
<th>Item</th>
<th>Function</th>
<th>Reference</th>
<th>Status</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM-PRO-Session-S-001</td>
<td>Support Server Notification</td>
<td>8</td>
<td>O</td>
<td>SCR-DM-NOTI-S-001</td>
</tr>
<tr>
<td>DM-PRO-Session-S-002</td>
<td>Support of receiving initiation message from client (Package #1), perform authentication and send initiation (Package #2)</td>
<td>8.4</td>
<td>M</td>
<td></td>
</tr>
</tbody>
</table>

### B.2.2 SCR for Session Abort

<table>
<thead>
<tr>
<th>Item</th>
<th>Function</th>
<th>Reference</th>
<th>Status</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM-PRO-Abort-S-001</td>
<td>Sending Session Abort Alert</td>
<td>8.1</td>
<td>O</td>
<td>DM-PRO-Abort-S-004 AND DM-PRO-Abort-S-005</td>
</tr>
<tr>
<td>DM-PRO-Abort-S-002</td>
<td>Receiving Session Abort Alert</td>
<td>8.1</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-Abort-S-003</td>
<td>Session Abort message includes Status and Results of executed commands</td>
<td>8.1.2</td>
<td>O</td>
<td>DM-PRO-Abort-S-001</td>
</tr>
<tr>
<td>DM-PRO-Abort-S-004</td>
<td>Include Final in Message</td>
<td>8.1.2</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-Abort-S-005</td>
<td>Sender of Abort must discard the response if response is received</td>
<td>8.1.1</td>
<td>O</td>
<td></td>
</tr>
</tbody>
</table>

### B.2.3 SCR for Multiple Messages

<table>
<thead>
<tr>
<th>Item</th>
<th>Function</th>
<th>Reference</th>
<th>Status</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM-PRO-Mul-S-001</td>
<td>Last message within multiple messages must contain Final</td>
<td>6.2</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-Mul-S-002</td>
<td>If message that is not the last one within Multiple Messages then the Next Message or Abort Alert must be sent</td>
<td>6.2</td>
<td>M</td>
<td></td>
</tr>
</tbody>
</table>
B.2.4 SCR for Large Object

<table>
<thead>
<tr>
<th>Item</th>
<th>Function</th>
<th>Reference</th>
<th>Status</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM-PRO-LO-S-001</td>
<td>Respond with Status 213 when a data chunk that is not the last one is received</td>
<td>7</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-LO-S-002</td>
<td>Management Commands inside Large Object are handled as Atomic</td>
<td>7</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-LO-S-003</td>
<td>While sending data chunks all chunks except the last one must include “MoreData”</td>
<td>7</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-LO-S-004</td>
<td>Data chunks must be sent in contiguous order without any new commands</td>
<td>7</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-LO-S-005</td>
<td>Data that fits into a single message must be sent in a single message</td>
<td>7</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-LO-S-006</td>
<td>Sending MaxObjSize to indicate size limitations for Package</td>
<td>7</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-LO-S-007</td>
<td>Never create packages bigger than the size the Client indicated in MaxObjSize</td>
<td>7</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-LO-S-008</td>
<td>Include Size in first data chunk</td>
<td>7</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-LO-S-009</td>
<td>Compare actual size and the Size value and report if not equal</td>
<td>7</td>
<td>M</td>
<td></td>
</tr>
</tbody>
</table>

B.2.5 SCR for User Interaction Commands

<table>
<thead>
<tr>
<th>Item</th>
<th>Function</th>
<th>Reference</th>
<th>Status</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM-PRO-UI-S-001</td>
<td>Sending Display Alert</td>
<td>10.2.1</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-UI-S-002</td>
<td>Sending Confirm or Reject Alert</td>
<td>10.2.2</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-UI-S-003</td>
<td>Sending Text Input Alert</td>
<td>10.2.3</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-UI-S-004</td>
<td>Sending Single Choice Alert</td>
<td>10.2.4</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-UI-S-005</td>
<td>Sending Multiple Choice Alert</td>
<td>10.2.4</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-UI-S-006</td>
<td>Order of the Items MUST be followed in the DM message</td>
<td>10.2</td>
<td>O</td>
<td></td>
</tr>
</tbody>
</table>

B.2.6 SCR for Generic Alert

<table>
<thead>
<tr>
<th>Item</th>
<th>Function</th>
<th>Reference</th>
<th>Status</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM-PRO-GAlert-S-001</td>
<td>Support for receiving, parsing and send Status back to client</td>
<td>8.7</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>DM-PRO-GAlert-S-002</td>
<td>Perform action from the data content in the Generic Alert</td>
<td>8.7</td>
<td>O</td>
<td></td>
</tr>
</tbody>
</table>
## Appendix C. Protocol Values

<table>
<thead>
<tr>
<th>VerProto Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM/1.3</td>
<td>Indicates that this DM message uses the OMA Device Management Protocol defined by the Open Mobile Alliance.</td>
</tr>
</tbody>
</table>