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About oneM2M

The purpose and goal of oneM2M is to develop technical specifications which address the need for a common M2M Service Layer that can be readily embedded within various hardware and software, and relied upon to connect the myriad of devices in the field with M2M application servers worldwide.

More information about oneM2M may be found at: http://www.oneM2M.org

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1 Scope

The specification will cover the protocol specific part of communication protocol used by oneM2M compliant systems as RESTful HTTP binding.

The scope of this specification is (not limited to as shown below):

- Binding oneM2M Protocol primitive types to HTTP method
- Binding oneM2M response status codes (successful/unsuccesful) to HTTP response codes
- Binding oneM2M RESTful resources to HTTP resources

This specification is depending on Core Protocol specification (TS-0004) for data types.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

2.1 Normative references

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<thead>
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<th>Description</th>
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<tr>
<td>[3] oneM2M TS-0004: Core Protocol TS</td>
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</tbody>
</table>

2.2 Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

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<thead>
<tr>
<th>Reference</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>[i.1] oneM2M Drafting Rules (<a href="http://member.onem2m.org/Static_pages/Others/Rules_Pages/oneM2M-Drafting-Rules-V1_0.doc">http://member.onem2m.org/Static_pages/Others/Rules_Pages/oneM2M-Drafting-Rules-V1_0.doc</a>)</td>
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</tr>
</tbody>
</table>
3 Definitions, symbols, abbreviations and acronyms

3.1 Definitions

3.2 Symbols

3.3 Abbreviations & Acronyms

For the purposes of the present document, the following abbreviations and acronyms apply:

- HTTP Hyper Text Transfer Protocol

4 Conventions

The key words “Shall”, "Shall not", “May”, "Need not”, “Should”, "Should not" in this document are to be interpreted as described in the oneM2M Drafting Rules [i.1]

5 Overview of HTTP Binding

This clause describes what oneM2M primitive parameters can be mapped to HTTP request/response messages.

5.1 Introduction

An HTTP request message consists of Request-Line, headers and message-body. An HTTP response message consists of Status-Line, headers and message-body [4]. This clause describes how oneM2M request/response primitives are mapped to HTTP messages at a high level. Corresponding details of each sub-clause are specified in clause 6.

5.2 Request-Line

- Method is mapped to the oneM2M operation parameter.
- Request-URI is derived from the oneM2M to parameter, including a query string which carries specific primitive parameters.
- HTTP-Version is specified in clause 6.

5.3 Status-Line

- HTTP Version is specified in clause 6.
- Status-Code and Reason-Phrase are derived from the oneM2M responseStatusCode parameter of the response primitive.

5.4 Header Fields

Mapping for the following header fields is specified in clause 6:

- Accept
- Content-Type
- Content-Location
- From
5.5 Message-body

Extension header fields may also be specified.

6 HTTP Message Mapping

6.1 Introduction

Mapping between HTTP message and oneM2M primitive shall be applied in the following cases:

- when the Originator sends a request primitive,
- when the Receiver receives a request primitive,
- when the Receiver sends a response primitive,
- when the Originator receives a response primitive.

The following sub-clauses specify how to map each oneM2M primitive parameter to a corresponding HTTP message field to compose a HTTP request/response message.

6.2 Request-Line

6.2.1 Method

Mapping between HTTP method in an HTTP request message and oneM2M operation parameter in a request primitive (clause 7.2.1.1.1 [6]) shall be applied in the following cases:

- when the Originator sends a request primitive,
- when the Receiver receives a request primitive.

The oneM2M operations shall be mapped as follows.

<table>
<thead>
<tr>
<th>oneM2M Operation</th>
<th>HTTP Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create</td>
<td>POST</td>
</tr>
<tr>
<td>Retrieve</td>
<td>GET</td>
</tr>
<tr>
<td>Update</td>
<td>PUT</td>
</tr>
<tr>
<td>Delete</td>
<td>DELETE</td>
</tr>
<tr>
<td>Notify</td>
<td>POST</td>
</tr>
</tbody>
</table>

Editor’s Note: Update operation mapping is TBD until the attribute level manipulation scheme is resolved in TS-0001 and TS-0004.
At the Receiver, an HTTP request message with POST method shall be mapped to a oneM2M Create or Notify request primitive in accordance with the value of the operation parameter.

6.2.2 Request-URI

Request-URI shall be mapped to the to parameter of the request primitive. Note: This may not include host and port number. Host and port number are carried in the Host header (see clause 6.3.1).

filterCriteria, nm, and ty parameters of the request primitive shall be mapped to query in the Request-URI.

Editor’s Note: parameters inclusion in query string or extended HTTP header is TBD.

6.2.3 HTTP-Version

This specification supports binding to HTTP 1.1, so the version field shall be set to “HTTP/1.1”.

6.3 Status-Line

6.3.1 HTTP-Version

This specification supports binding to HTTP 1.1, so the version field shall be set to “HTTP/1.1”.

6.3.2 Status-Code

The oneM2M responseStatusCode shall be mapped to HTTP Status-Code. Since the responseStatusCode have been defined more specifically, one or more responseStatusCode may be mapped to Status-Code. The original responseStatusCode parameter shall be carried in message-body (see clause 6.5).

N:1 status code mapping from the oneM2M request primitive to HTTP request message shall be:

<table>
<thead>
<tr>
<th>oneM2M Response Status Codes</th>
<th>HTTP Status Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>200 (OK)</td>
</tr>
<tr>
<td>Accepted</td>
<td>202 (Accepted)</td>
</tr>
<tr>
<td>Location info not authorized</td>
<td>403 (Forbidden)</td>
</tr>
<tr>
<td>Unsupported resource</td>
<td>404 (Not Found)</td>
</tr>
<tr>
<td>Unsupported attribute</td>
<td>404 (Not Found)</td>
</tr>
<tr>
<td>Cannot forward, target not reachable</td>
<td>404 (Not Found)</td>
</tr>
<tr>
<td>Cannot forward, other reason TBD</td>
<td>404 (Not Found)</td>
</tr>
<tr>
<td>Create error - no privilege</td>
<td>403 (Forbidden)</td>
</tr>
<tr>
<td>Create error - already exists</td>
<td>403 (Forbidden)</td>
</tr>
<tr>
<td>Create error - missing mandatory parameter</td>
<td>400 (Bad Request)</td>
</tr>
<tr>
<td>Retrieve error - no privilege</td>
<td>403 (Forbidden)</td>
</tr>
<tr>
<td>Retrieve error - does not exist</td>
<td>404 (Not Found)</td>
</tr>
<tr>
<td>Update error - no privilege</td>
<td>403 (Forbidden)</td>
</tr>
<tr>
<td>Error/Operation</td>
<td>Response Code</td>
</tr>
<tr>
<td>------------------------------------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Update error - does not exist</td>
<td>404 (Not Found)</td>
</tr>
<tr>
<td>Update error - unacceptable contents</td>
<td>415 (Unsupported Media Type)</td>
</tr>
<tr>
<td>Delete error - does not exist</td>
<td>404 (Not Found)</td>
</tr>
<tr>
<td>Delete error - no privilege</td>
<td>403 (Forbidden)</td>
</tr>
<tr>
<td>Create delivery - not able to take on responsibility</td>
<td>403 (Forbidden)</td>
</tr>
<tr>
<td>Create fanoutpoint - group request identifier exists</td>
<td>409 (Conflicts)</td>
</tr>
<tr>
<td>Retrieve fanoutpoint - group request identifier exists</td>
<td>409 (Conflicts)</td>
</tr>
<tr>
<td>Update fanoutpoint - group request identifier exists</td>
<td>409 (Conflicts)</td>
</tr>
<tr>
<td>Delete fanoutpoint - group request identifier exists</td>
<td>409 (Conflicts)</td>
</tr>
<tr>
<td>Create mgmtObj - memory shortage</td>
<td>403 (Forbidden)</td>
</tr>
<tr>
<td>External object not found</td>
<td>404 (Not Found)</td>
</tr>
<tr>
<td>Cancel execInstance - not cancellable</td>
<td>403 (Forbidden)</td>
</tr>
<tr>
<td>Cancel execInstance - already complete</td>
<td>403 (Forbidden)</td>
</tr>
<tr>
<td>Delete execInstance - not cancellable</td>
<td>403 (Forbidden)</td>
</tr>
<tr>
<td>Delete execInstance - already complete</td>
<td>403 (Forbidden)</td>
</tr>
<tr>
<td>Retrieve CSEBase - format error</td>
<td>400 (Bad Request)</td>
</tr>
<tr>
<td>CMDH rules - non compliant</td>
<td>403 (Forbidden)</td>
</tr>
<tr>
<td>Target is not subscribable</td>
<td>403 (Forbidden)</td>
</tr>
<tr>
<td>Cannot initiate subscription verification</td>
<td>403 (Forbidden)</td>
</tr>
<tr>
<td>Subscription verification failed</td>
<td>403 (Forbidden)</td>
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</tbody>
</table>

Editor’s Note: This table needs to be updated aligning with TS-0004.

### 6.3.3 Reason-Phrase

Reason-Phrase shall be mapped to the description of the corresponding responseStatusCode of the response primitive (see clause 6.5.4 [3]).

### 6.4 Header Fields

#### 6.4.1 Host

A Host header shall be included in an HTTP request message. Other headers may be included in an HTTP request/response message. Host shall be derived from the to parameter of the request primitive. This shall consist of the host and optionally port number.

#### 6.4.2 Accept

An Originator may use the Accept header to indicate which content-type is supported by the Originator. The Accept header shall be set to “application/onem2m-resource+xml” or “application/onem2m-resource+json”.

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Editor’s Note: Supported types are TBD.

6.4.3 Content-type

Any request or response containing message-body shall include the Content-type header set to “application/onem2m-resource+xml” or “application/onem2m-resource+json”.

Editor’s Note: Supported types are TBD.

6.4.4 Content-Location

The Content-Location header shall be set to the URI of:

- the created resource, when responding to a Create request primitive;
- the retrieved resource, when responding to a Retrieve request primitive if the retrieved resource location is different from the requested resource location;
- the updated resource, when responding to a Update request primitive

Editor’s Note: Supported types are TBD.

6.4.5 Content-Length

If message-body is included, the Content-Length header shall be included indicating the length of the message-body in octets (8-bit bytes).

6.4.6 ETag

A retrieve response primitive corresponding to a resource retrieval request primitive should include an ETag header together with the resource representation [1].

ETag facilitates the use of conditional requests (i.e. using the if-match and if-none-match HTTP headers).

If a CSE supports the ETag header, then the CSE shall support conditional requests.

6.4.7 From

The From header shall be mapped to the from parameter of the request/response primitive, and shall contain the oneM2M specified ID of the Originator (e.g. CSE-ID or AE-ID).

6.4.8 Location

The Location header shall be mapped to the URI of the created resource. This header shall be present in the response primitive corresponding to a create request and shall not be present in any other request or response.

Editor’s Note: if Originator’s nm parameter can be modified and accepted by the Hosting CSE is TBD.

6.4.9 X-M2M-RI

All requests and responses shall include an oneM2M defined header field called X-M2M-RI that contains the requestID.

Editor’s Note: mapping request ID can be query or this extension header, this is TBD.

6.4.10 Other Header Fields

Other HTTP header fields shall be mapped with oneM2M primitive parameters.

Editor’s Note: The list of the fields and details are FFS.
6.5 Message-body

Depends on the operation type and the reference point, the combination of the primitive parameters may be different (see clause 7.2.1.1 [3]).

In HTTP request message, among the request parameters (see Table 7.2.1.1-1 [3]) Message-body shall include mandatory parameters except primitive type, to, from, request identifier parameter and may include conditional/optional parameters.

In HTTP response message, among the response parameters (see Table 7.2.1.1-2 and 7.2.1.1-3 [3]) Message-body shall include mandatory parameters except primitive type parameter and may include conditional/optional parameters.

7 Security Consideration

7.1 Authentication on HTTP Request Message

When sending the credential to be checked by Registrar CSE, Proxy-Authorization header should be used as specified in HTTP/1.1 (see RFC2617).

When sending the credential to be checked by Hosting CSE, Authorization header should be used as specified in HTTP/1.1.

When the credential to be checked by Hosting CSE is an Access Token which is compatible with OAuth 2.0 framework, the Bearer authentication scheme shall be used as specified in RFC6750.

Note: TS-0003 [oneM2M Security Solutions] does not provide any details on usage or provisioning the token.

7.2 Transport Layer Security

oneM2M primitive parameters contained in HTTP messages may be protected by TLS as hop-by-hop manner, not end-to-end. For the details, see clause 6.1 [TS-0003]
Annex A (Informative): Example Procedures

A.1 AE Registration

The following diagram is HTTP mapping of procedure described in clause 7.3.4.2.1.

**Figure A.1-1 oneM2M HTTP Binding Example – AE Registration**
Annex B (Informative) WebSocket

B.1 Notification using WebSocket

WebSocket [3] can be used for transporting notifications to an AE/CSE. This can be useful for an AE/CSE which is not server-capable or cannot be reachable for delivery of unsolicited requests.

For example, when an AE needs to receive a notification message from the CSE, the AE establishes a WebSocket connection to a CSE. When a new notification message is generated, the notification will be sent to the AE as the data frame of the WebSocket.
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Annex <y>:
Bibliography

The annex entitled "Bibliography" is optional.

It shall contain a list of standards, books, articles, or other sources on a particular subject which are not mentioned in the document itself.

It shall not include references mentioned in the document.

Use the Heading 9 style for the title and B1+ or Normal for the text.

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OR

<Publication>: "<Title>".

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### Draft history (to be removed on publication)

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