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TECHNICAL SPECIFICATION

oneM2M;
CoAP Protocol Binding
(oneM2M TS-0008 version 2.6.1 Release 2A)

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Foreword

This Technical Specification (TS) has been produced by ETSI Partnership Project oneM2M (oneM2M).

1   Scope

The present document will cover the protocol specific part of communication protocol used by oneM2M compliant systems as 'RESTful CoAP binding'.

The scope of the present document is (not limited to as shown below):

- Binding oneM2M primitives to CoAP messages.

- Binding oneM2M Response Status Codes to CoAP Response Codes.

- Defining behaviour of a CoAP Client and Server depending on oneM2M parameters.

2   References

2.1   Normative 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.

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The following referenced documents are necessary for the application of the present document.

[1]   IETF RFC 7252: "The Constrained Application Protocol (CoAP)".

[2]   ETSI TS 118 104: "oneM2M; Service Layer Core Protocol Specification (oneM2M TS-0004)".

[3]   IETF RFC 7959: "Block-Wise Transfers in the Constrained Application Protocol (CoAP)".

[4]   ETSI TS 118 103: "oneM2M; Security Solutions (oneM2M TS-0003)".

[5]   IETF RFC 6347: "Datagram Transport Layer Security Version 1.2".

2.2   Informative 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.

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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.

[i.1]   oneM2M Drafting Rules.

NOTE: Available http://www.onem2m.org/images/files/oneM2M-Drafting-Rules.pdf.

3 Definition of terms, symbols and abbreviations

3.1 Terms

Void.

3.2 Symbols

Void.

3.3 Abbreviations

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

ACK	ACKnowledgement
AE	Application Entity
ATI	Assigned Token Identifiers
CON	CONfirmable
CSE	Common Service Entity
CTO	Content Offset
CTS	Content Status
DTLS	Datagram Transport Layer Security
EC	Event Category
GID	Group Request Identifier
HTTP	Hyper Text Transfer Protocol
IANA	Internet Assigned Numbers Authority
IP	Internet Protocol
OET	Operation Execution Time
OT	Originating Timestamp
RQI	Request Identifier
RSC	Response Status Code
RST	CoAP ReSeT message
RTURI	notificationURI
RVI	Release Version Indicator
TCP	Transport Control Protocol
TLS	Transport Layer Security
TLV	Tag - Length - Value (data structure)
TY	Resource Type
UDP	User Datagram Protocol
URI	Uniform Resource Identifier
VSI	Vendor Information
XML	eXtensible Markup Language

4 Conventions

The keywords "Shall", "Shall not", "May", "Need not", "Should", "Should not" in the present document are to be interpreted as described in the oneM2M Drafting Rules [i.1].

5 Overview

5.0 Introduction

The clause describes which features need to be supported in CoAP layer and introduces a message format and several features of CoAP used in this protocol binding specification.

5.1 Required Features

This clause explicitly specifies the required features of the CoAP layer for oneM2M to properly bind oneM2M primitives into CoAP messages:

- The 4-byte binary CoAP message header is defined in section 3 of IETF RFC 7252 [1].

- Confirmable (CON), Acknowledgement (ACK) and Reset (RST) messages shall be supported. The Reset message is used to send an error message in response to a malformed Confirmable message in CoAP layer.

- GET, PUT, POST and DELETE methods shall be supported. oneM2M primitives map to these methods.

- A subset of Response Code specified in clause 6.2.4 shall be supported for oneM2M *Response Status Code* parameter mapping.

- The Uri-Host, Uri-Port, Uri-Path, and Uri-Query shall be supported.

- The Content-Type Option shall be used to indicate the media types of the payload.

- The Token Option may be used.

- Block-wise transfers feature may be supported to carry large payloads.

- Caching feature may be supported.

5.2 Introduction of CoAP

5.2.0 Introduction

This clause describes a message format, and caching and block-wise transfers features which may be used to map oneM2M primitives to CoAP messages.

5.2.1 Message Format

This clause specifies details about the CoAP (IETF RFC 7252 [1]) message format:

- CoAP message occupies the data section of one UDP datagram.

- CoAP message format supports a 4-byte fixed-size header.

- Fixed-size header is followed by a Token value of length 0 to 8 bytes.

- The Token value is followed by a sequence of zero or more CoAP Options in TLV format.

- CoAP Options are followed by the payload part.

For more details on the CoAP message format and the supported header fields, see IETF RFC 7252 [1].

5.2.2   Caching

5.2.2.0   Introduction

CoAP (IETF RFC 7252 [1]) supports caching of responses to fulfil future equivalent requests to the same resource. Caching is supported using freshness and validity information carried with CoAP (IETF RFC 7252 [1]) responses.

5.2.2.1   Freshness

- CoAP server shall use Max-Age CoAP Option to specify the explicit expiration time for the CoAP Response's resource representation. This indicates that the response is not fresh after its age is greater than the specified number of seconds.

- Max-Age Option defaults to a value of 60 (seconds). In case, Max-Age Option is not present in the cacheable response, the response shall not be considered fresh after its age is greater than 60 seconds.

- The CoAP server shall set the Max-Age Option value to 0 (zero) to prevent or disable caching.

- The CoAP client, having a fresh stored response, can make new request matching the request for that stored response. In this case, the new response shall invalidate the old response.

5.2.2.2   Validity

- A CoAP endpoint with stored responses but not able to satisfy subsequent requests (for example, the response is not fresh), shall use the Etag Option to perform a conditional request to the CoAP server where the resource is hosted.

- If the cached response with the CoAP client is still valid, the server shall include the Max-Age Option in the response along with a code of 2.03 - Valid. This shall update the freshness of the cached response at the CoAP client.

- If the cached response with the CoAP client is not valid, the server shall respond with an updated representation of the resource with response code 2.05 - Content. The CoAP client shall use the updated response to satisfy request and may also replace/update the stored or cached response.

5.2.3   Blockwise Transfers

CoAP Block (IETF RFC 7959 [3]) Options may be used when CoAP endpoints need to transfer large payloads e.g. firmware, software updates. Instead of relying on IP fragmentation, CoAP Block Option should be used for transferring multiple blocks of information in multiple request-response pairs.

6   CoAP Message Mapping

6.1   Introduction

When AE or CSE binds oneM2M primitives to CoAP messages, or binds CoAP messages to oneM2M primitives, it is required that:

- AE shall host a CoAP client and should host a CoAP server; or

- CSE shall host both a CoAP client and a CoAP server.

Basically single oneM2M request primitive is mapped to single CoAP request message, and single oneM2M response primitive is mapped to single CoAP response message. However, single oneM2M request/response primitive is mapped to multiple CoAP request/response messages respectively when CoAP block-wise transfers feature is used.

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

- when the Originator sends a request primitive;

- when the Receiver receives a CoAP message(s);

- when the Receiver sends a response primitive;

- when the Originator receives a CoAP message(s).

The following sub-clauses specify how to map each oneM2M primitive parameter defined in ETSI TS 118 104 [2] to a corresponding CoAP message field to compose a CoAP request/response message.

6.2 Primitive Mapping to CoAP Message

6.2.0 Introduction

This clause describes where to map oneM2M parameters in a primitive to header, Option and payload fields in a CoAP message.

6.2.1 Header

This clause specifies how to configure CoAP header information:

- The Version field shall be configured as 1.

- The Type field shall be configured according to clause 6.3. The Reset message is used to send an error message in response to a malformed Confirmable message in CoAP layer.

- In case of a request, the Code field indicates CoAP Method. The oneM2M *Operation* parameter shall be mapped to a CoAP Method according to the table 6.2.1-1.

- In case of a response, the Code field indicates CoAP Response Code. The oneM2M *Response Status Code* parameter shall be mapped to CoAP Response Code as specified in clause 6.2.4.

The configurations of Token Length and Message ID are left to implementation.

Table 6.2.1-1: oneM2M Operation Parameter Mapping

oneM2M Operation Parameter	CoAP Method
CREATE	POST
RETRIEVE	GET
UPDATE	PUT
DELETE	DELETE
NOTIFY	POST

At the Receiver, CoAP request message with POST method shall be mapped to oneM2M CREATE or NOTIFY *Operation* parameter in accordance with the existence of *Resource Type* parameter. If *Resource Type* parameter exists then value of the *Operation* parameter is CREATE and if *Resource Type* parameter does not exist, the value of *Operation* parameter is NOTIFY.

6.2.2 Configuration of Token and Options

6.2.2.0 Introduction

This clause describes configuration of Token and Options based on oneM2M parameters.