

CoRE
Internet-Draft
Intended status: Standards Track
Expires: February 8, 2019

T. Fossati
Nokia
K. Hartke
Ericsson
C. Bormann
Universitaet Bremen TZI
August 07, 2018

Multipart Content-Format for CoAP
draft-ietf-core-multipart-ct-02

Abstract

This memo defines application/multipart-core, an application-independent media-type that can be used to combine representations of several different media types into a single CoAP message-body with minimal framing overhead, each along with a CoAP Content-Format identifier.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of [BCP 78](#) and [BCP 79](#).

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at <https://datatracker.ietf.org/drafts/current/>.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

This Internet-Draft will expire on February 8, 2019.

Copyright Notice

Copyright (c) 2018 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to [BCP 78](#) and the IETF Trust's Legal Provisions Relating to IETF Documents (<https://trustee.ietf.org/license-info>) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must

include Simplified BSD License text as described in Section 4.e of the Trust Legal Provisions and are provided without warranty as described in the Simplified BSD License.

Table of Contents

1.	Introduction	2
2.	Multipart Content-Format Encoding	3
3.	Usage Examples	3
3.1.	Observing Resources	3
3.2.	Implementation hints	4
4.	IANA Considerations	5
4.1.	Registration of media type application/multipart-core . .	5
4.2.	Registration of a Content-Format identifier for application/multipart-core	6
5.	Security Considerations	6
6.	References	7
6.1.	Normative References	7
6.2.	Informative References	7
	Acknowledgements	7
	Authors' Addresses	8

[1.](#) Introduction

This memo defines application/multipart-core, an application-independent media-type that can be used to combine representations of several different media types into a single CoAP [[RFC7252](#)] message-body with minimal framing overhead, each along with a CoAP Content-Format identifier.

This simple and efficient binary framing mechanism can be employed to create application specific request and response bodies which build on multiple already existing media types.

Applications using the application/multipart-core Content-Format define the internal structure of the application/multipart-core representation.

For example, one way to structure the sub-types specific to an application/multipart-core container is to always include them at the same fixed position. This specification allows to indicate that an optional part is not present by substituting a null value for the representation of the part.

Optionally, an application might use the general format defined here, but also register a new media type and an associated Content-Format identifier -- typically one in the range 10000-64999 -- instead of using application/multipart-core.

2. Multipart Content-Format Encoding

A representation of media-type application/multipart-core contains a collection of zero or more representations, each along with their respective content format.

The collection is encoded as a CBOR [[RFC7049](#)] array with an even number of elements. The second, fourth, sixth, etc. element is a byte string containing a representation, or the value "null" if an optional part is indicated as not given. The first, third, fifth, etc. element is an unsigned integer specifying the content format ID of the representation following it. (Future extensions might want to include additional alternative ways of specifying the media type of a representation in such a position.)

For example, a collection containing two representations, one with content format ID 42 and one with content format ID 0, looks like this in CBOR diagnostic notation:

```
[42, h'0123456789abcdef', 0, h'3031323334']
```

For illustration, the structure of an application/multipart-core representation can be described by the CDDL [[I-D.ietf-cbor-cddl](#)] specification in Figure 1:

```
multipart-core = [* multipart-part]
multipart-part = (type: uint .size 2, part: bytes / null)
```

Figure 1: CDDL for application/multipart-core

3. Usage Examples

3.1. Observing Resources

When a client registers to observe a resource [[RFC7641](#)] for which no representation is available yet, the server may send one or more 2.05 (Content) notifications before sending the first actual 2.05 (Content) or 2.03 (Valid) notification. The possible resulting sequence of notifications is shown in Figure 1.

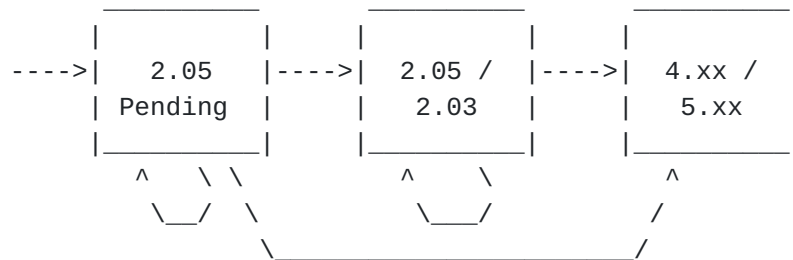


Figure 2: Sequence of Notifications:

The specification of the Observe option requires that all notifications carry the same Content-Format. The application/multipart-core media type can be used to provide that Content-Format: e.g., carrying an empty list of representations in the case marked as "Pending" in Figure 2, and carrying a single representation specified as the target content-format in the case in the middle of the figure.

3.2. Implementation hints

This section describes the serialization for readers that may be new to CBOR. It does not contain any new information.

An application/multipart-core representation carrying no representations is represented by an empty CBOR array, which is serialized as a single byte with the value 0x80.

An application/multipart-core representation carrying a single representation is represented by a two-element CBOR array, which is serialized as 0x82 followed by the two elements. The first element is an unsigned integer for the Content-Format value, which is represented as described in Table 1. The second element is the object as a byte string, which is represented as a length as described in Table 2 followed by the bytes of the object.

Serialization	Value
0x00..0x17	0..23
0x18 0xnn	24..255
0x19 0xnn 0xnn	256..66535

Table 1: Serialization of content-format

Serialization	Length
0x40..0x57	0..23
0x58 0xnn	24..255
0x59 0xnn 0xnn	256..66535
0x5a 0xnn 0xnn 0xnn 0xnn	66536..4294967295
0x5b 0xnn .. 0xnn (8 bytes)	4294967296..

Table 2: Serialization of object length

For example, a single text/plain object (content-format 0) of value "Hello World" (11 characters) would be serialized as

```
0x82 0x00 0x4b H e l l o 0x20 w o r l d
```

In effect, the serialization for a single object is done by prefixing the object with information about its content-format (here: 0x82 0x00) and its length (here: 0x4b).

For more than one representation included in an application/multipart-core representation, the head of the CBOR array is adjusted (0x84 for two representations, 0x86 for three, ...) and the sequences of content-format and embedded representations follow.

4. IANA Considerations

4.1. Registration of media type application/multipart-core

IANA is requested to register the following media type [[RFC6838](#)]:

Type name: application

Subtype name: multipart-core

Required parameters: N/A

Optional parameters: N/A

Encoding considerations: binary

Security considerations: See the Security Considerations Section of RFCthis

Interoperability considerations: N/A

Published specification: RFCthis

Applications that use this media type: Applications that need to combine representations of potentially several media types into one, e.g., EST-CoAP [[I-D.ietf-ace-coap-est](#)]

Fragment identifier considerations: N/A

Additional information:

Deprecated alias names for this type: N/A

Magic number(s): N/A

File extension(s): N/A

Macintosh file type code(s): N/A

Person & email address to contact for further information:
iesg@ietf.org

Intended usage: COMMON

Restrictions on usage: N/A

Author: CoRE WG

Change controller: IESG

Provisional registration? (standards tree only): no

[4.2.](#) Registration of a Content-Format identifier for application/multipart-core

IANA is requested to register the following Content-Format to the "CoAP Content-Formats" subregistry, within the "Constrained RESTful Environments (CoRE) Parameters" registry, from the Expert Review space (0..255):

Media Type	Encoding	ID	Reference
application/multipart-core	--	TBD1	RFcthis

[5.](#) Security Considerations

The security considerations of [[RFC7049](#)] apply. In particular, resource exhaustion attacks may employ large values for the byte

string size fields, or deeply nested structures of recursively embedded application/multipart-core representations.

6. References

6.1. Normative References

- [RFC7049] Bormann, C. and P. Hoffman, "Concise Binary Object Representation (CBOR)", [RFC 7049](#), DOI 10.17487/RFC7049, October 2013, <<https://www.rfc-editor.org/info/rfc7049>>.
- [RFC7252] Shelby, Z., Hartke, K., and C. Bormann, "The Constrained Application Protocol (CoAP)", [RFC 7252](#), DOI 10.17487/RFC7252, June 2014, <<https://www.rfc-editor.org/info/rfc7252>>.
- [RFC7641] Hartke, K., "Observing Resources in the Constrained Application Protocol (CoAP)", [RFC 7641](#), DOI 10.17487/RFC7641, September 2015, <<https://www.rfc-editor.org/info/rfc7641>>.

6.2. Informative References

- [I-D.ietf-ace-coap-est] Stok, P., Kampanakis, P., Kumar, S., Richardson, M., Furuheid, M., and S. Raza, "EST over secure CoAP (EST-coaps)", [draft-ietf-ace-coap-est-05](#) (work in progress), July 2018.
- [I-D.ietf-cbor-cddl] Birkholz, H., Vigano, C., and C. Bormann, "Concise data definition language (CDDL): a notational convention to express CBOR data structures", [draft-ietf-cbor-cddl-03](#) (work in progress), July 2018.
- [RFC6838] Freed, N., Klensin, J., and T. Hansen, "Media Type Specifications and Registration Procedures", [BCP 13](#), [RFC 6838](#), DOI 10.17487/RFC6838, January 2013, <<https://www.rfc-editor.org/info/rfc6838>>.

Acknowledgements

Most of the text in this draft is from earlier contributions by two of the authors, Thomas Fossati and Klaus Hartke. The re-mix in this document is based on the requirements in [\[I-D.ietf-ace-coap-est\]](#), based on discussions with Michael Richardson, Panos Kampanis and Peter van der Stok.

Authors' Addresses

Thomas Fossati
Nokia

Email: thomas.fossati@nokia.com

Klaus Hartke
Ericsson
Torshamnsgatan 23
Stockholm SE-16483
Sweden

Email: klaus.hartke@ericsson.com

Carsten Bormann
Universitaet Bremen TZI
Postfach 330440
Bremen D-28359
Germany

Phone: +49-421-218-63921

Email: cabo@tzi.org

