

Network Working Group
Internet-Draft
Intended status: Standards Track
Expires: August 22, 2019

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February 18, 2019

FETCH & PATCH with Sensor Measurement Lists (SenML)
draft-ietf-core-senml-etch-02

Abstract

The Sensor Measurement Lists (SenML) media type and data model can be used to send collections of resources, such as batches of sensor data or configuration parameters. The CoAP iPATCH, PATCH, and FETCH methods enable accessing and updating parts of a resource or multiple resources with one request. This document defines new media types for the CoAP iPATCH, and FETCH methods for resources represented with the SenML data model.

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[1.](#) Introduction

The Sensor Measurement Lists (SenML) media type [\[RFC8428\]](#) and data model can be used to transmit collections of resources, such as batches of sensor data or configuration parameters.

Example of a SenML collection is shown below:

```
[
  {"bn":"2001:db8::2/3306/0/", "n":"5850", "vb":true},
  {"n":"5851", "v":42},
  {"n":"5750", "vs":"Ceiling light"}
]
```

Here three resources "3306/0/5850", "3306/0/5851", and "3306/0/5750", of an IPSO dimmable light smart object [\[IPSO\]](#) are represented using a single SenML Pack with three SenML Records. All resources share the same base name "2001:db8::2/3306/0/", hence full names for resources are "2001:db8::2/3306/0/5850", etc.

The CoAP [\[RFC7252\]](#) iPATCH and FETCH methods [\[RFC8132\]](#) enable accessing and updating parts of a resource or multiple resources with one request.

This document defines two new media types, one using the JavaScript Object Notation (JSON) [\[RFC8259\]](#) and one using the Concise Binary

Object Representation (CBOR) [[RFC7049](#)], that can be used with the CoAP iPATCH, PATCH, and FETCH methods for resources represented with the SenML data model. The semantics of the new media types are the same for the CoAP PATCH and iPATCH methods.

2. Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [BCP 14](#) [[RFC2119](#)] [[RFC8174](#)] when, and only when, they appear in all capitals, as shown here.

Readers should also be familiar with the terms and concepts discussed in [[RFC8132](#)] and [[RFC8428](#)]. Also the following terms are used in this document:

Fetch Record: One set of parameters that is used to match SenML Record(s).

Fetch Pack: One or more Fetch Records in an array structure.

Patch Record: One set of parameters similar to Fetch Record but also containing instructions on how to change existing SenML Pack(s).

Patch Pack: One or more Patch Records in an array structure.

Target Record: A Record in a SenML Pack that is matching the selection criteria of a Fetch or Patch Record and hence is a target for a Fetch or Patch operation.

3. Using FETCH and iPATCH with SenML

The FETCH/iPATCH media types for SenML are modeled as extensions to the SenML media type to enable re-use of existing SenML parsers and generators, in particular on constrained devices. Unless mentioned otherwise, FETCH and PATCH Packs are constructed with the same rules and constraints as SenML Packs. The only difference to SenML media type is allowing the use of "null" value for removing records with the iPATCH method.

3.1. SenML FETCH

The FETCH method can be used to select and return parts of one or more SenML Packs. The SenML Records are selected by giving the name(s) of the resources using the SenML "name" and/or "base name" Fields.

For example, to select resources "5850" and "5851" from the example in [Section 1](#), the following Fetch Pack can be used:

```
[
  {"bn":"2001:db8::2/3306/0/", "n":"5850"},
  {"n":"5851"}
]
```

The result to a FETCH request with the example above would be:

```
[
  {"bn":"2001:db8::2/3306/0/", "n":"5850", "vb":true},
  {"n":"5851", "v":42},
]
```

When SenML Records contain also time values, a name may no longer uniquely identify a single Record. When no time is given in a Fetch Record, all SenML Records with the given name are matched. When time is given in the Fetch Record, only a SenML Record (if any) with equal time value and name is matched.

The resolved form of records ([Section 4.6 of \[RFC8428\]](#)) is used when comparing the names and times of the Target and Fetch Records to accommodate for differences in use of the base values.

3.2. SenML iPATCH

The iPATCH method can be used to change the values of SenML Records, to add new Records, and to remove existing Records. The names and times of the Patch Records are given and matched in same way as for the Fetch Records, except each Patch Record can match at most one Target Record. Patch Packs can also include new values and other SenML Fields for the Records.

When the name in a Patch Record matches with the name in an existing Record, the time values are compared. If the time values do not exist or are equal in both Records, the Target Record is replaced with the contents of the Patch Record.

If a Patch Record contains a name, or combination of a time value and a name, that do not exist in any existing Record in the Pack, the given Record, with all the fields it contains, is added to the Pack.

If a Patch Record has a value field with value null, the matched Record (if any) is removed from the Pack.

For example, the following document could be given as iPATCH payload to change/set values of two SenML Records for the example in [Section 1](#):

```
[
  {"bn":"2001:db8::2/3306/0/", "n":"5850", "vb":false},
  {"n":"5851", "v":10}
]
```

If the request is successful, the resulting representation of the example SenML Pack would be as follows:

```
[
  {"bn":"2001:db8::2/3306/0/", "n":"5850", "vb":false},
  {"n":"5851", "v":10},
  {"n":"5750", "vs":"Ceiling light"}
]
```

[4.](#) Security Considerations

The security and privacy considerations of SenML apply also with the FETCH and iPATCH methods.

In FETCH and iPATCH requests, the client can pass arbitrary names to the target resource for manipulation. The resource implementer must take care to only allow access to names that are actually part of (or accessible through) the target resource.

If the client is not allowed to do a GET or PUT on the full target resource (and thus all the names accessible through it), access control rules must be evaluated for each record in the pack.

[5.](#) IANA Considerations

This document registers two new media types and CoAP Content-Format IDs for both media types.

Note to RFC Editor: Please replace all occurrences of "RFC-AAAA" with the RFC number of this document.

[5.1.](#) CoAP Content-Format Registration

IANA is requested to assign CoAP Content-Format IDs for the SenML PATCH and FETCH media types in the "CoAP Content-Formats" sub-registry, within the "CoRE Parameters" registry [[RFC7252](#)]. All IDs are assigned from the "IETF Review or IESG Approval" range. The assigned IDs are show in Table 1.

Media type	ID
application/senml-etch+json	TBD
application/senml-etch+cbor	TBD

Table 1: CoAP Content-Format IDs

5.2. senml-etch+json Media Type

Type name: application

Subtype name: senml-etch+json

Required parameters: none

Optional parameters: none

Encoding considerations: Must be encoded as using a subset of the encoding allowed in [[RFC8259](#)]. See RFC-AAAA for details. This simplifies implementation of very simple system and does not impose any significant limitations as all this data is meant for machine to machine communications and is not meant to be human readable.

Security considerations: See [Section 4](#) of RFC-AAAA.

Interoperability considerations: Applications MUST ignore any key value pairs that they do not understand unless the key ends with the '_' character in which case an error MUST be generated. This allows backwards compatible extensions to this specification.

Published specification: RFC-AAAA

Applications that use this media type: Applications that use the SenML media type for resource representation.

Fragment identifier considerations: N/A

Additional information:

Magic number(s): none

File extension(s): senml-etchj

Windows Clipboard Name: "SenML FETCH/PATCH format"

Macintosh file type code(s): none

Macintosh Universal Type Identifier code: org.ietf.senml-etch-json
conforms to public.text

Person & email address to contact for further information: Ari
Keranen ari.keranen@ericsson.com

Intended usage: COMMON

Restrictions on usage: None

Author: Ari Keranen ari.keranen@ericsson.com

Change controller: IESG

5.3. senml-etch+cbor Media Type

Type name: application

Subtype name: senml-etch+cbor

Required parameters: none

Optional parameters: none

Encoding considerations: Must be encoded as using [[RFC7049](#)]. See
RFC-AAAA for details.

Security considerations: See [Section 4](#) of RFC-AAAA.

Interoperability considerations: Applications MUST ignore any key
value pairs that they do not understand unless the key ends with the
'_' character in which case an error MUST be generated. This allows
backwards compatible extensions to this specification.

Published specification: RFC-AAAA

Applications that use this media type: Applications that use the
SenML media type for resource representation.

Fragment identifier considerations: N/A

Additional information:

Magic number(s): none

File extension(s): senml-etchc

Macintosh file type code(s): none

Macintosh Universal Type Identifier code: org.ietf.senml-etch-cbor
conforms to public.data

Person & email address to contact for further information: Ari
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Intended usage: COMMON

Restrictions on usage: None

Author: Ari Keranen ari.keranen@ericsson.com

Change controller: IESG

6. Acknowledgements

The use of FETCH and iPATCH methods with SenML was first introduced by the OMA SpecWorks LwM2M v1.1 specification. This document generalizes the use to any SenML representation. The authors would like to thank Carsten Bormann, Christian Amsuess, Jaime Jimenez, Klaus Hartke, and also everyone in the IETF CoRE and OMA SpecWorks DMSE working groups for their contributions and reviews.

7. References

7.1. Normative References

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- [RFC8428] Jennings, C., Shelby, Z., Arkko, J., Keranen, A., and C. Bormann, "Sensor Measurement Lists (SenML)", [RFC 8428](#), DOI 10.17487/RFC8428, August 2018, <<https://www.rfc-editor.org/info/rfc8428>>.

[7.2.](#) Informative References

- [IPSO] IPSO, "IPSO Smart Object Guidelines", 2018, <<https://www.omaspecworks.org/develop-with-oma-specworks/ipso-smart-objects/guidelines/>>.

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