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A. Keranen
Ericsson
C. Bormann
Universitaet Bremen TZI
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SenML Data Value Content-Format Indication
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Abstract

The Sensor Measurement Lists (SenML) media type supports multiple types of values, from numbers to text strings and arbitrary binary data values. In order to simplify processing of the data values this document proposes to specify a new SenML field for indicating the Content-Format of the data.

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1. Introduction

The Sensor Measurement Lists (SenML) media type [RFC8428] can be used to send various different kinds of data. In the example given in Figure 1, a temperature value, an indication whether a lock is open, and a data value (with SenML field "vd") read from an NFC reader is sent in a single SenML pack.

```
[
  {"bn":"urn:dev:ow:10e2073a01080063:","n":"temp","u":"Cel","v":7.1},
  {"n":"open","vb":false},
  {"n":"nfc-reader","vd":"aGkgCg"}
]
```

Figure 1: SenML pack with unidentified binary data

The receiver is expected to know how to decode the data in the "vd" field based on the context, e.g., name of the data source and out-of-band knowledge of the application. However, this context may not always be easily available to entities processing the SenML pack. To facilitate automatic decoding it is useful to be able to indicate an Internet media type and content-coding right in the SenML Record. The CoAP Content-Format (Section 12.3 in [RFC7252]) provides just this information; enclosing a Content-Format number (in this case number 60 as defined for media type application/cbor in [RFC7049]) in the Record is illustrated in Figure 2. All registered CoAP content formats are listed in the Content Formats subregistry of the CoRE Parameters registry [IANA.core-parameters].

```
{"n":"nfc-reader", "vd":"gmNmb28YKg", "ct":60}
```

Figure 2: SenML Record with binary data identified as CBOR

In this example SenML Record the data value contains a string "foo" and a number 42 encoded in a CBOR [RFC7049] array. Since the example above uses the JSON format of SenML, the data value containing the binary CBOR value is base64-encoded. The data value after base64 decoding is shown with CBOR diagnostic notation in Figure 3.

```
82           # array(2)
   63        # text(3)
      666F6F # "foo"
   18 2A     # unsigned(42)
```

Figure 3: Example Data Value in CBOR diagnostic notation

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 [RFC8428]. Awareness of terminology issues discussed in [I-D.bormann-core-media-content-type-format] can also be very helpful.

3. SenML Content-Format ("ct") Field

When a SenML Record contains a Data Value field ("vd"), the Record MAY also include a Content-Format indication field. The Content-Format indication uses label "ct" and an unsigned integer value in the range of 0-65535 indicating the CoAP Content-Format of the data (similar to CoRE Link Format [RFC6690] "ct" attribute, except that the Link Format attribute happens to be encoded as a string).

4. Using Content-Type and Content-Coding With the "ct" Field

Since some Internet media types and their content coding and parameter alternatives do not have assigned CoAP Content-Format identifiers, the "ct" field can alternatively be used to indicate the Content-Type and Content-Coding of the data. If Content-Coding is not specified with Content-Type, identity (i.e., no) transformation is used.

If Content-Coding is used, the content-coding value (e.g., "deflate") MUST be prefixed with "@" and concatenated with the media type and parameters (if any). For example: "application/json@deflate".

5. SenML Base Content-Format ("bct") Field

The Base Content-Format Field, label "bct", provides a default value for the Content-Format Field (label "ct") within its range. The range of the base field includes the record containing it, up to (but not including) the next record containing a "bct" field, if any, or up to the end of the pack otherwise. Resolution (Section 4.6 of [RFC8428]) of this base field is performed by adding its value with the label "ct" to all records in this range that carry a "vd" field but do not already contain a Content-Format ("ct") field.

6. Security Considerations

The indication of a media type in the data does not exempt a consuming application from properly checking its inputs. Also, the ability for an attacker to supply crafted SenML data that specify media types chosen by the attacker may expose vulnerabilities of handlers for these media types to the attacker.

7. IANA Considerations

IANA is requested to assign new labels in the "SenML Labels" subregistry of the SenML registry [IANA.senml] (as defined in [RFC8428]) for the Content-Format indication as per Table 1:

Name	Label	JSON Type	XML Type	Reference
Base Content-Format	bct	Number/String	int/string	this document
Content-Format	ct	Number/String	int/string	this document

Table 1: IANA Registration for new SenML Labels

Acknowledgements

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9. References

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Authors' Addresses

Ari Keranen
Ericsson
Jorvas 02420
Finland

Email: ari.keranen@ericsson.com

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

Phone: +49-421-218-63921
Email: cabo@tzi.org