

Evaluation on SenML encoding API

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Introduction

This report evaluates the SenML API in contiki. The test were done by generating JSON and CBOR messages with the API and comparing the results. The CBOR messages were verified by using wireshark and unit testing by contiki standard.

Results

Here is the number of bytes a SenSML message used, with different encoding and contents.

Used bytes in stream message (short strings and values)

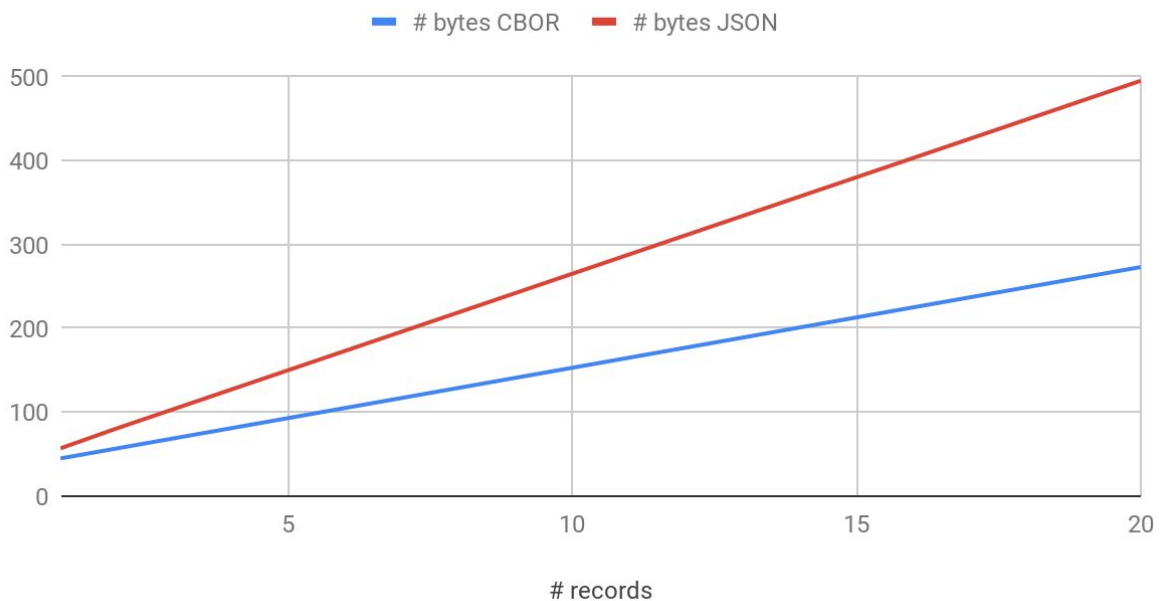


Fig 1. This graph show result from records with short string and float values with 4 value figures

The graph in fig 1, is based on messages with noise sensor data. A typical message with 2 records would look like this:

SenML:

```
[{"bn": "urn:dev:mac:fcc2030000007903", "u": "dB", "v": 73.50}, {"u": "dB", "v": 73.50}, ...]
```

CBOR:

```
0x9FBF21781C75726E3A6465763A6D61633A666363323033303030303030373930330162644202FA42930000FFBF0162644202FA42930000FF...
```

Used bytes in stream message (no strings and small float values)

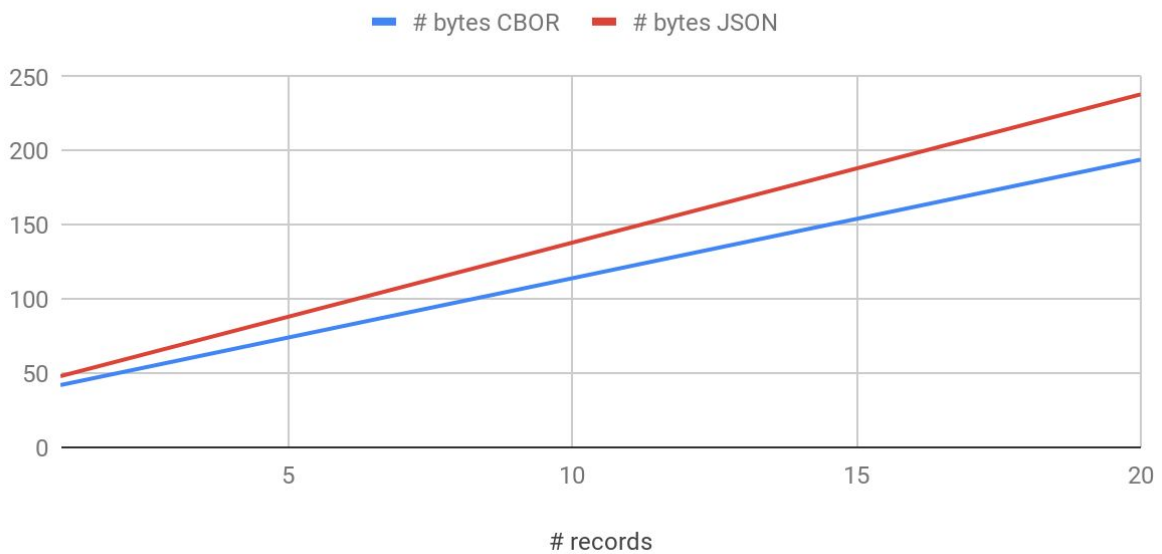


Fig 2. The records in this test contains no strings and float values with 2 value figures

This graph, fig 2, is instead based on SenML records that only send very small floats. This is a worst case scenario for CBOR since the API always sends floats with 32-bit regardless of the value. However, CBOR still decreases the message size in comparison to JSON.

SenML:

```
[{"bn":"urn:dev:mac:fcc23d000000050f","v":1.0},{ "v":1.0},{ "v":1.0},...
```

CBOR:

```
0x9FBF21781D75726E3A6465763A6D61633A666363323364303030303030303530663B01FA3F80
0000FFBF01FA3F800000FFBF01FA3F800000FF...
```

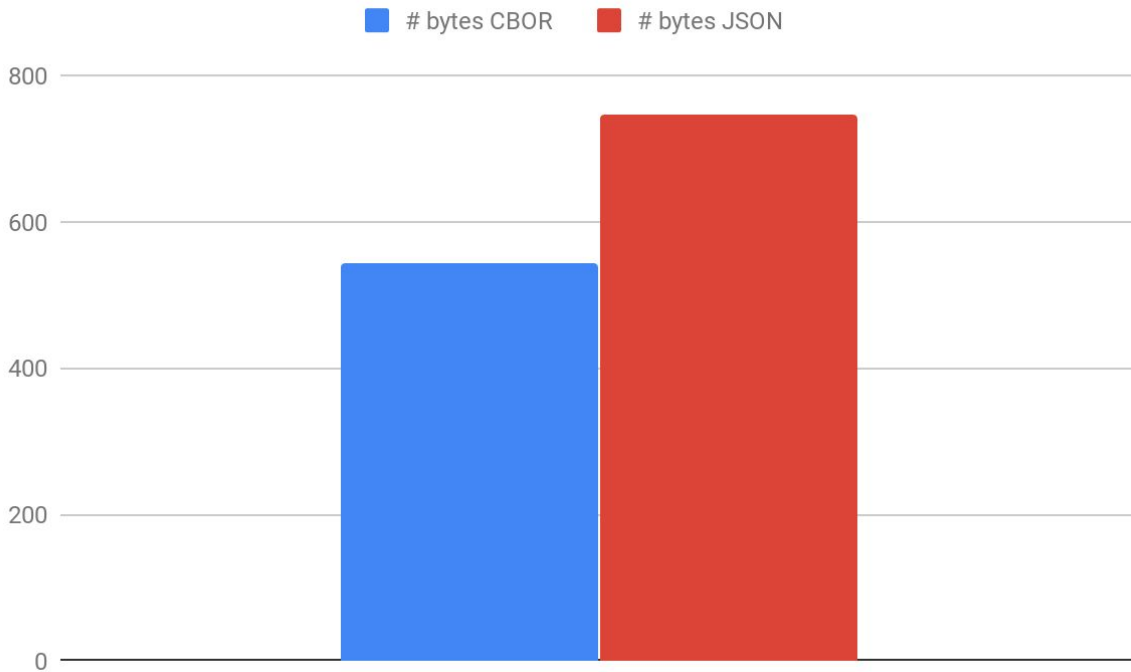


Fig 3. Diagram of an average senML pack from Green IoT.

The average message usually contains a majority of strings. Since strings are encoded with the same number of bytes in both of the formats, the difference between the two is not as significant as with values.

Messages in fig 3 are shown below:

JSON:

```
[{"bn":"urn:dev:mac:fcc23d000000050f","bt":197188},{ "n":"seq_no","u":"count","v":3202},{ "n":"pms5003;tsi;pm1","u":"ug/m3","v":2},{ "n":"pms5003;tsi;pm1_5","u":"ug/m3","v":5},{ "n":"pms5003;tsi;pm10","u":"ug/m3","v":5},{ "n":"pms5003;atm;pm1","u":"ug/m3","v":2},{ "n":"pms5003;atm;pm2_5","u":"ug/m3","v":5},{ "n":"pms5003;atm;pm10","u":"ug/m3","v":5},{ "n":"pms5003;db;0_3","u":"cnt/dm3","v":591},{ "n":"pms5003;db;0_5","u":"cnt/dm3","v":152},{ "n":"pms5003;db;1","u":"cnt/dm3","v":30},{ "n":"pms5003;db;2_5","u":"cnt/dm3","v":0},{ "n":"pms5003;db;5","u":"cnt/dm3","v":0},{ "n":"pms5003;db;10","u":"cnt/dm3","v":0},{ "n":"bme280;temp","u":"Cel","v":17.3400002},{ "n":"bme280;humidity","u":"%RH","v":38.0600014},{ "n":"bme280;pressure","u":"hPa","v":1030.57996}]
```

Bytes: 747

CBOR:

```
0x9fbf21781d75726e3a6465763a6d61633a666363323364303030303030303530663b22fa48409100ffb00667365715f6e6f0165636f756e7402fa45482000ffb006f706d73353030333b7473693b706d31016575672f6d3302fa40000000ffb0071706d73353030333b7473693b706d315f35016575672f6d3302fa40a00000ffb0070706d73353030333b7473693b706d3130016575672f6d3302fa40a00000ffb006f706d73353030333b61746d3b706d31016575672f6d3302fa40000000ffb0071706d73353030333b61746d3b706d325f35016575672f6d3302fa40a00000ffb0070706d73353030333b61746d3b706d313001657567
```

2f6d3302fa40a00000ffbf006e706d73353030333b64623b305f330167636e742f646d3302fa4413c000ff
bf006e706d73353030333b64623b305f350167636e742f646d3302fa43180000ffbf006c706d73353030
333b64623b310167636e742f646d3302fa41f00000ffbf006e706d73353030333b64623b325f35016763
6e742f646d3302fa00000000ffbf006c706d73353030333b64623b350167636e742f646d3302fa0000000
0ffbf006d706d73353030333b64623b31300167636e742f646d3302fa00000000ffbf006b626d65323830
3b74656d70016343656c02fa418ab852ffbf006f626d653238303b68756d6964697479016325524802fa
42183d71ffbf006f626d653238303b7072657373757265016368506102fa4480d28ffff

Bytes: 542