16/05/2022

Observation JSON Format

Présentation

Environmental Sensing

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1 INTRODUCTION

ObsJSON is a text format for the ES-Observation data.

This format is an application of the JSON format (RFC 8259), GeoJSON format (RFC 7946), Date and Time format (RFC 3339).

A binary version is also defined (Appendix) with CBOR format (RFC 8949)

1.1 CONVENTIONS USED

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 BCP14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

The grammatical rules in this document are to be interpreted as described in [RFC5234].

1.2 TERMINOLOGY

The terms Json-Text, Json-Value (Value), Object, Member, Array, Number, String, False, Null, True are define in the JSON grammar.

The terms Geometry-type, Point, MultiPoint, LineString, MultiLineString, Polygon, MultiPolygon, GeometryCollection, GeoJSON-Types are defined in GeoJSON grammar.

Timestamp is defined in Date and Time format.

1.3 RULES

A Value in an ESValue SHOULD be unambiguous (i.e., parsers CAN deduce the Value type).

An ObsJSON-Text CAN contains all the ESObservation information (i.e., the ESObservation build from the ObsJSON-Text is identical to the initial ESObservation).

Values in Array are ordered and independent from the other Values.

Members in Objects are not ordered.

2 Environmental Sensing – Observation

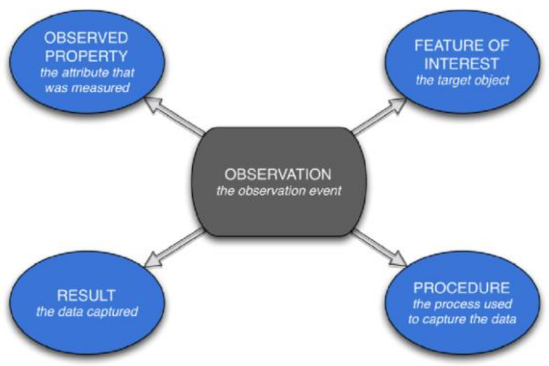
2.1 Principles

The concept of "Observation" is defined in the ISO19156 Standard. It allows to represent for example:

- Unit data from sensors,
- Modeling results,
- Geographical distributions,
- Temporal or trip histories,

In this Standard, an Observation is characterized by:

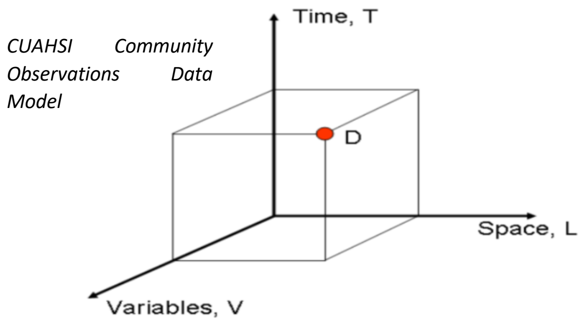
- "Observed property": the observed property,
- "Feature of interest": the object (usually a place) of the observation,
- "Procedure": the information acquisition mode (sensor, model, etc.)
- "result": result of the observation or measurement



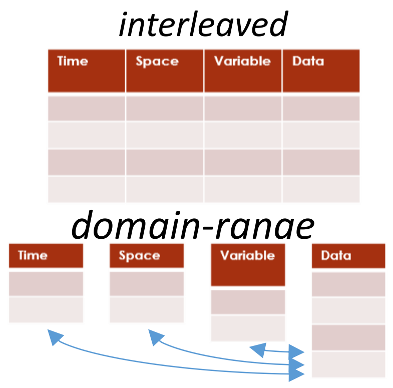
The result is a set of values referenced according to the 3 dimensions:

- Temporal,
- Spatial,
- Physical (observed property)

It can be converted into a 3-dimensional matrix, with each result indexed by temporal, spatial and physical values.



Note: This "domain range" indexed representation is preferred to an "interleaved" tabular representation which associates temporal, spatial, and physical values with each result value.



Common properties (flags) are associated with each Observation. They make it possible to perform processing on the Observations without having to know their composition (e.g., bounding boxes, type of observation, volumetry, etc.).

Note: If the indexed representation is identical to the original, the "domain range" representation is equivalent to the "interleaved" tabular representation.

2.2 Data model

An Observation is an Ilist Object (Result, Features and Index data - see Appendix).

The Features included in the Ilist Object are "named values" (see chapter 4 ESValue) with defined types: datation, location, properties but also "open types" (see chapter 4).

Other information completes the Ilist Object:

- Type
- Attributes (name, id)
- Data (user data, information data, parameter data)

2.3 Type

The Type characterizes the nature of Observation and ESValue such as 'datetime', 'Ilist', 'slot'.

The type is defined by a string.

3 OBSJSON OBJECTS

3.1 OBSERVATION

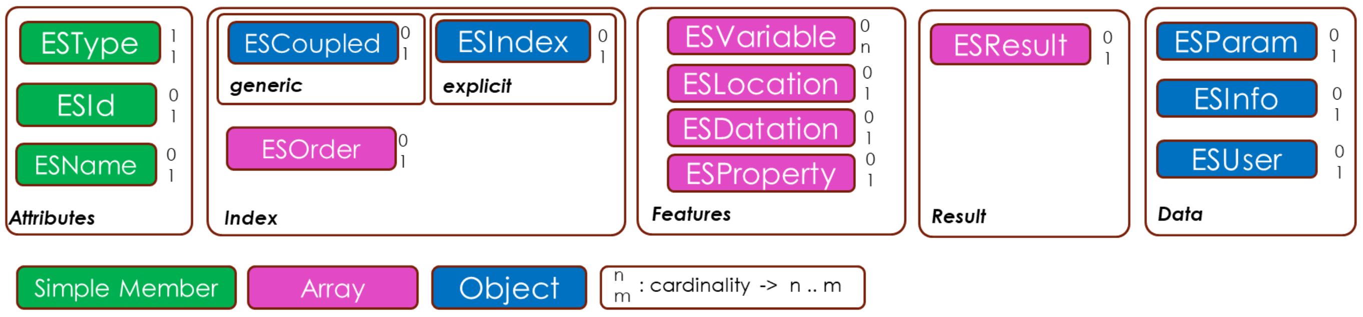
An ObsJSON is a JSON-text and represents an Observation.

ObsJSON is defined by a Type and consists of an object (ESObservation).

Type : “observation”

Description

The ESObservation Members are described in the figure below:



The Members are:

Category	Member	Key	Value
Attributes	ESName	« name »	String
Attributes	Type	« type »	« observation »
Attributes	ESId	« id »	String
Result	ESResult	« result »	Array or ResultValue
Features	ESDatation	« datation »	Array or DatationValue
Features	ESLocation	« location »	Array or LocationValue
Features	ESProperty	« property »	Array or PropertyValue
Features	ESVariable	String	Array or Object
Index	ESIndex	« index »	Array or ESIdx
Index	ESCoupled	« coupled »	Object
Index	ESOrder	« order »	Array
Data	ESInformation	« information »	Object
Data	ESParameter	« parameter »	Object
Data	ESUserData	String	Object

All those members are optional.

Validity

An ESObservation is valid if:

- it contains at least the Type Member,
- it contains at most one ESDatation, one ESLocation, one ESProperty, one ESResult Member
- each Member is valid.

Example

```
{“type”: “observation”, “datation”: “morning”, “location”: “paris”, “property”: “air quality”, “result”: “good”}

{“type”: “observation”, “datation”: “2021-01-05T22:18:26”, “location”: [2.4, 48.9], “property”: {“prp”: “PM10”, “unit”: “µg/m3”}, “result”: 51.3}
```

3.2 Attribute Member

3.2.1 ESId

Description

ESId is a single key/value Member:

- Key: “id”

The value is a string (e.g., Database Id or filename)

Validity

ESId is valid if key and value are as defined.

3.2.2 ESName

Description

ESName is a single key/value Member:

- Key: “name”

The value is a string.

Validity

ESName is valid if key and value are as defined.

3.3 Result Member

Description

Value of Result Member is an Array. Result is represented by an ESResult Member

Member	Key	Value

ESResult	« result »	Array of ESValue

Note:

If the Array contains only one value, the square brackets MAY be omitted in the JSON String.

Validity

An ESResult Member is valid if:

- it contains at least one value
- each value is valid

Example

```
"result": 21.5                                                 one NamedValue
"result": [21.5, [2.4, 48.9], {"valid value": 43.3}, "high"]   four NamedValue
```

3.4 Feature Member

Description

Value of Feature Member is an Array. The Value Type is identical in an Array of defined Feature Member (ESDatation, ESLocation, ESProperty) or can be specific for each value of the Array (ESVariable):

Member	Key	Value
ESDatation	« datation »	Array of DatationValue
ESLocation	« location »	Array of LocationValue
ESProperty	« property »	Array of PropertyValue
ESVariable	String	Array of any ESValue

Note:

If the Array contains only one value, the square brackets MAY be omitted in the JSON String.

The key of ESVariable MUST be different from Reserved Names.

Validity

An ESFeature Member is valid if:

- it contains at least one value
- each value is valid
- the Type of each value is consistent with the ESFeature

Example

```
“location”: “paris”                                         one LocationValue
“location”: [[2.4, 48.9], [4.8, 45.8], [5.4, 43.3]]        three LocationValue
“location”: [“paris”, “lyon”, “marseille”]                  three LocationValue
```

3.5 Index Members

Several configurations are allowed:

Configuration	ESOrder	ESCoupled	ESIndex
Complete ordered and not coupled	-	-	-
Complete ordered and coupled	-	X	-
Complete non ordered and coupled	X	X	-
Complete non ordered and not coupled	X	-	-
Non complete and ordered	-	-	X
Non complete and not ordered	X	-	X

Complete: True if the Indexed List is complete (see Appendix)

Ordered: True if the order of Feature is the alphabetical order and if the Result name is ‘result’ or is after the Features (in the alphabetical order)

Coupled: True is at least two Features are coupled (see Appendix)

3.5.1 ESOrder

Description

ESOrder define the order in ESIndex (explicit index form) or in Result (generic index form). ESOrder is a String Array.

The strings in the Array are the ESFeature keys ordered according to indexing.

If ESOrder is not present, the default value [`“datation”, “location”, “property”, “first ESVariable key”] is used.`

Validity

ESOrder is valid if:

- The values are present in ESFeature list,
- The length of the array equals the number of ESFeature.

Example

```
“order”: [“datation”, “property”, “location”}
```

3.5.2 ESCoupled

Description

ESCoupled is used only with the “generic form”.

ESCoupled is an Object. The members are key/value and represent coupled ESFeature:

- Key: ESFeature key
- Value: ESFeature key

If no one ESFeature is coupled, ESCoupled is not present.

Validity

ESCoupled is valid if at least one member is present and if ESFeature keys are present in ESObservation.

Example

```
“coupled”: {“datation”: “location”}                datation and location are coupled
```

3.5.3 ESIndex

Description

ESIndex represent the “explicit form” of the index (see Indexed List Appendix)

It’s a two-dimensional array following the order defined in ESOrder:

- One row for each ESFeature,
- One column for each ResultValue

The values in Array are integer.

Note:

> *If the ESObservation contains only one ESFeature, the square brackets for row MAY be omitted.*
> *If the ESObservation contains only one ResultValue, the square brackets for column MAY be omitted.*
> *If only one level of square brackets is present, the parser must decide if columns or rows are present*

Validity

An ESIndex Value is valid if:

- it contains at least one integer value
- the number of rows equals the number of ESFeature
- the number of columns equals the number of ResultValue

- the integer values are positive and lower than the length of ESFeature

Example

```
“index”: [[0,2,1], [0,0,0]]           two ESFeature, three ResultValue
“index”: [0,2,1]                 one ESFeature, three ResultValue (or the opposite)
```

3.6 Data Member

Data are Members where the Value MAY be an Object.

3.6.1 ESInformation

Description

The Value of an ESInformation is an Object where Members are:

Member	Key	Value
ObservationType	« typeobs »	String
LocationType	« typeloc »	String
DatationType	« typedat »	String
PropertyType	« typeprp »	String
ResultType	« typeres »	String
nValLocation	« nvalloc »	Integer
nValDatation	« nvaldat »	Integer
nValProperty	« nvalprp »	Integer
nValResult	« nvalres »	Integer
BoundingBox	« bbox »	Array (4 Float)
IntervalBox	« tbox »	Array (2 String)
Complet	« complete »	True / false
Score	« score »	Integer
Rate	« rate »	Float
Dimension	« dimension »	Integer
Axes	« axes »	Array (1 to 3 integers)

Validity

An ESInformation is valid if the Value contains at least one Member.

All the Value Members are optional.

Example

```
{"typeobs": "areaObsrecord"}                                     Minimal Value
{"typeobs": "areaObsrecord", "complete": false, "score": 226}    Defined Member
```

Note:

That information come from the other ESObervation elements.

A parser MAY ignore The ESInformation Member to build an ESObservation.

3.6.2 ESParameter

Description

The Value of an ESParameter is an Object where Members are:

Member	Key	Value
Reference	« reference »	String
ResultTime	« resulttime »	Timestamp or DateTime
PropertyDict	« pdict »	String
UniqueIndex	« unicindex »	True/false

Validity

An ESParameter is valid if the Value contains at least one Member.

All the Value Members are optional.

Example

```
{“unicindex”: true, “approbation”: true}
```

3.6.3 ESUserData

The structure of ESUserData Member is totally free.

The keys used in ESUserData MUST be different from those defined in the Reserved list name (see Appendix.)

4 ESVALUE

The ESValue are the Values included in the Feature or Result Arrays.

Five kinds of ESValue (one Type for each) are defined:

- DatationValue
- LocationValue
- PropertyValue
- NamedValue
- ExternValue

4.1 STRUCTURE

Description

An ESValue is defined by a Type and a TypedValue which contains two information: A Name, a Value.

Two formats are used for ESValue:

TypedValue format:	TypedValue
UntypedValue format:	{Type: TypedValue}

The TypedValue format is used for ESDatation, ESLocation or ESProperty Features or with NamedValue.

The UntypedValue format is used for ESResult or ESVariable and not with NamedValue

Validity

An ESValue is valid if:

- One of the two formats is used,
- The TypedValue format is used in the defined cases
- The Type is a string present in the TypeCatalog (see Appendix)
- The TypedValue is valid for the Type
- each Value is valid compared to ESFeature

Note:

If the ESValue is an Object and the key is not recognized as a valid Type, the TypedValue format is used.
If the ESValue is an Object and contains more than one Member, the TypedValue format is used.

If the ESValue is an Object, contains one Member and the key is a valid Type, the UntypedValue format is used.

4.2 TypedValue

Description

One of the three formats SHALL be used for TypedValue (where Name is a String):

- Name-Value format: {Name: Value}
- Value format: Value
- Name format: Name

Validity

A TypedValue is valid if:

- One of the three formats is used,
- it contains at least a Value or a Name
- each Value is valid compared to ESFeature

Note:

The Name string MAY be used to represent:

- *detailed information (e.g., "beginning of the observation"),*
- *link to external information (e.g., "https://loco-philippe.github.io/ES.html"),*
- *id to link internal information (e.g., "res003" where "res003" is a key in a ESData Object),*

If the TypedValue is an Object and contains more than one Member, the Value Format is used.

Example

```
"morning"                                                Name format
{"morning": "2021-01-05T10:00:00"}                       Name-Value format
[["2021-01-05T08:00:00", "2021-01-05T12:00:00"]]         Value format
```

4.3 DatationValue

Type : "datvalue"

Description

A Date is defined by a String Timestamp (as specified in RFC 3339).

The Value of a DatationValue is a representation of a single Date, an Interval (Array of two Dates) or a Slot (MultiInterval):

- Date: String
- Slot: Array of one or multiple Interval

Validity

A Value is valid if the Date or Slot is valid.

Value example

```
"2021-01-05T10:00:00"                                          Date
[["2021-01-05T08:00:00", "2021-01-05T12:00:00"]]               Interval
[["2021-01-05", "2021-01-10"], ["2021-01-20", "2021-01-25"]]   Slot
```

Note:

Intervals MUST be represented by a Slot to avoid ambiguities with an array of Dates

If the DatationValue consists of a unique String, and if the String represents a Date, the parser SHALL assign the String to the Date, otherwise to the Name.

4.4 LocationValue

Type : "locvalue"

Description

The Value of a LocationValue is a representation of a Point or a Polygon. It is defined by a Coordinates Array (as specified in GeoJSON).

Validity

A Value is valid if the Coordinates Array is valid and represents a Point or a Polygon.

Value example

```
[2.4, 48.9]                                                    Point
[[[2.4, 48.9], [4.8, 45.8], [5.4, 43.3], [2.4, 48.9]]]         Polygon
[[[0,0], [0,5], [5,5], [0,0]], [[1,1], [1,2], [2,2], [1,1]]]   Polygon with a hole
```

Note:

The other Geometry-type are not allowed because the Coordinates Array is ambiguous:

- *LineString, Multipoint and Array of Point have the same representation*
- *Polygon and Array of LineString have the same representation*
- *MultiPolygon and Array of Polygon have the same representation*

The LineString in a Polygon MAY be open (without the last Point)

4.5 PropertyValue

Type : "prpvalue"

Description

The Value of a PropertyValue is an Object. The Members are:

Member	Key	Value
PropertyType	« prp »	String (mandatory)
Unit	« unit »	String
SamplingFunction	« sampling »	String
Application	« application »	String
SensorType	« sensor »	String
UpperValue	« uppervalue »	Float
LowerValue	« lowervalue »	Float
Period	« period »	Float
UpdateInterval	« updateinterval »	Float
Uncertainty	« uncertainty »	Float
UserMember	String	JSON Object

Note:

If the PropertyValue consists of a single Member (the PropertyType), it's not allowed to replace the Object by a string (the PropertyType value).
If the PropertyDict is not defined, the default PropertyDict is used

Validity

A Value is valid if it contains at least the PropertyType Member.

The PropertyType value MAY be present in a PropertyDict how's define the Unit value

Value example

```
{"prp": "Temp"}                                               Minimal Value
{"prp": "Temp", "unit": "°c"}                                 Defined Member
{"prp": "Temp", "unit": "°c", "operation": "phase 1"}         User Member
```

Note:

For PropertyValue, the Name format is allowed (i.e., if the PropertyValue consists of a single string, this SHOULD be interpreted as the name).

4.6 NamedValue

Type : "namvalue"

Description

The Value of a NamedValue CAN be any Json-Value. This category is used when:

- The Json-value is simple (e.g. a number)
- The Json-Value is complex and needs to be decoded outside (real Type unknown)

Note:

The TypedValue format is always used
For NamedValue, the Name format is not allowed (i.e., if the NameValue consists of a single string, this SHOULD be interpreted as a Value).

Validity

Only the ESValue Rules.

Example

```
21.8                                                    Value format
{"age": 25}                                             Name-Value format
{"coord": [2.4, 48.9]}                                  Name-value format
"test"                                                  Value format
```

4.7 ExternValue

The ExternValue is the Value associated to a Type different from 'datvalue', 'locvalue', 'prpvalue' and 'namvalue' (see Appendix).

Description

The Value of an ExternValue CAN be any Json-Value and SHOULD be consistent with the Type.

Validity

Only the ESValue Rules.
The conformity to the Type is extern

Example

```
21.8                                                    Value format
{"datetime": "2021-05-02"}                              type-value format
```

`{“age”: 25}`	*Value format*
`{“locvalue”: [2.4, 48.9]}`	*type-value format*
`[21.8, {“test”: true}]`	*Value format*
`{“namvalue”: {“test”: {“locvalue”: {“Paris”: [2.4, 48.9]}}}`	*type-value format*

Note:

The UntypedValue format is always used
If Type-Value format is used, the parser MUST be able to decode the JSON Object define by the Type-Value format, otherwise the parser decodes the JSON Object as a Value.

5 APPENDIX: TYPECATALOG

Object	Intern / extern	Type
Observation	ext	observation
DatationValue	Int / ext	datvalue
LocationValue	Int / ext	locvalue
PropertyValue	Int / ext	prpvalue
NamedValue	ext	namvalue
ExternValue	Ext	extvalue
Ilist	ext	ilist
Coordinates	ext	coordinate
datetime	ext	datetime
TimeSlot	ext	timeslot

6 APPENDIX : RESERVED VALUES

« type »
« id »
« datation »
« location »
« property »
« result »
« information »
« parameter »
« observation »
« prp »
« unit »
« sampling »
« application »
« sensor »
« uppervalue »
« lowervalue »
« period »
« updateinterval »
« uncertainty »
« typeobs »
« typeloc »
« typedat »
« typeprp »
« typeres »
« nvalloc »
« nvaldat »
« nvalprp »
« nvalres »
« bbox »
« tbox »
« complet »
« score »
« rate »
« dimension »
« axes »
« reference »
« resulttime »
« order »
« propdict »
« unicindex »

7 Appendix : Examples

- {“type”: “observation”, “datation”: “morning”, “location”: “paris”, “property”: “air quality”, “result”: “good”}

- {“type”: “observation”, “datation”: “2021-01-05T22:18:26”, “location”: [2.4, 48.9], “property”: {“prp”: “PM10”}, “result”: 51.3}

- {“type”: “observation”, “datation”: [“2021-01-05T22:18:26”, “2021-01-05T22:18:26”], “property”: [“air quality PM10”, “air quality PM2.5”], “result”: [10.2, 21.5, 51.3, 48]}

- {“type”: “observation”, “name”: “example4”, “id”: “example4.obs”,

```
 “parameter”: {“pdict”: “official”, “example”:4},
 “datation”:
      [“2021-01-04T10:00:00”,[[“2021-01-05T08:00:00”,“2021-01-05T12:00:00”]]],
 “location”:
      [[2.4, 48.9], [[[2.4, 48.9], [4.8, 45.8], [5.4, 43.3], [2.4, 48.9]]]],
 “property”:
      [{“prp”: “PM10”, “unit”: “µg/m3”}, {“prp”: “Temp”, “unit”: “°c”}]
 “result”: [51.3, {“low temperature”: 2.4}, 20.8, “high temperature”]
 “coupled”: {“datation”: “location”}}
```

Note: another solution is to include index instead of “coupled”:

```
         “index”: [[0,0,1,1], [0,0,1,1], [0,1,0,1]]
```

8 APPENDIX : CBOR FORMAT

The Concise Binary Object Representation (CBOR – RFC8949) is a data format whose design goals include the possibility of extremely small code size, small message size, and extensibility without the need for version negotiation.

CBOR is based on the JSON data model: numbers, strings, arrays, maps (called objects in JSON), and a few values such as false, true, and null.

The CBOR format can be used with different options to minimize length:

- The precision of float values is adjustable from half precision (two bytes) to double precision (eight bytes),
- The datetime can be described by a standard text string (RFC3339) or by a numerical value (Epoch-based: six bytes).
- The ESFeature name can be represented with code value instead of string value
- The coordinates value can be described with integer instead of float (val_int = round(val_float)*10**7 : four bytes).

Example (Json format):

```
{"type": "observation",
"datation":["2021-01-04T10:00:00",[["2021-01-05T08:00:00","2021-01-5T12:00:00"]]],
"location":[[2.4123456, 48.9123456], [[[2.4123456, 48.9123456], [4.8123456, 45.8123456], [5.4123456, 43.3123456], [2.4123456, 48.9123456]]]],
"property": [{"prp": "PM10"}, {"prp": "Temp"}],
"result": [51.348, {"low": 2.457}, 20.88, "high"],
"coupled": {"datation": "location"}}
```

Example optimized (Cbor format):

```
{0 : [0,1,2],
1 : [[dt(2021, 1, 4, 10),[[dt(2021,1,5,8), dt(2021, 1, 5, 12]]],
     [[2.4123456, 48.9123456], [[[2.4123456, 48.9123456], [4.8123456, 45.8123456], [5.4123456, 43.3123456], [2.4123456, 48.9123456]]]],
     [{"prp": "PM10"}, {"prp": "Temp"}] ],
2 : [51.34375, {"low": 2.45703125}, 20.875, "high"],
3 : {0: 1} }
```

With :

- *Observation key codification:*
  - *0: “order”*
  - *1: “features”*
  - *2: “result”*
  - *3: “coupled”*
- *Order and coupled value codification:*
  - *0: “datation”*
  - *1: “location”*
  - *2: “property”*
- *Datation value: timestamp format*
- *Location value: integer representation (four bytes)*
- *Result value: half precision (two bytes)*

Length (bytes):

- JSON: 388
- CBOR: 298
- CBOR optimized: 133

9 APPENDIX : INDEXED LIST

An Indexed List (Ilist) represents an information (result) and the characteristics of this information (features).

Example: Observation, Measurement, Log…

An Ilist is an object with three components:

- Result: a named and ordered data set (array). The result elements can be every kind of object,
- FeatureSet: an ordered set of Features. Each Feature is a named and ordered set of every kind of object,
- Index: a specific object that describe the relationship between Result and Features

The main feature of this object is that there is no data duplication.

Example :

First name	*height*
Philip	*1.75*
Anne	*1.80*

Result : { 'height' : [1.75, 1.8] }

FeatureSet : { 'first name' : ['philip', 'anne'] }

Index : [[0, 1], [0, 1]]

All tabular data can be represented by an indexed list.

Example :

First name	*Last name*	*Weight*	*Height*
Philip	*Red*	*85*	*1.75*
Anne	*White*	*70*	*1.80*

Equivalent to:

First name	*Last name*	*Measure*	*Value*
Philip	*Red*	*Weight*	*85*
Philip	*Red*	*Height*	*1.75*
Anne	*White*	*Weight*	*70*
Anne	*White*	*Height*	*1.80*

Result : { 'value' : [85, 1.75, 70, 1.80] }

FeatureSet :
{ 'first name' : ['philip', 'anne'],
'last name' : ['red, 'white'],
'measure': ['weight', 'height'] }

Index :
Explicit: [[0, 0, 0], [0, 0, 1], [1, 1, 0], [1, 1, 1]]
or Generic: { 'coupled' : {0:1} }

The index can take several forms:

- Explicit form: For each Feature element, a number indicate the index of the result value (see examples above),

- Generic form: For each FeatureSet, two numbers can be defined :
  - Order: the result ordered priority of the FeatureSet
  - Coupled: the equivalent index FeatureSet
- Implicit form: The order is implicit if it is the same as the Feature order in the FeatureSet. The Reference is implicit if there is no equivalence.

In the last example, the generic form is :

- Coupled: {0: 1} (the index last name is coupled to the index first name)
- Order: [0, 1, 2] (the result is ordered first with name and second with measure). In this case, the order is implicit.

In most cases, the Index can remain implicit.

This representation of data is optimized (no duplication). The "cost" of added data (Index value) is minimal in the most cases (generic or implicit index).

Note: In a few cases, the implicit or the generic forms are not possible. It is then necessary to complete the data to obtain a complete set (or to have "trivial" index : [0, 1, 2, 3, …]),

Example:

First name	*Measure*	*Value*
Philip	*Weight*	*85*
Philip	*Height*	*1.75*
Anne	*Weight*	*70*

Result : { 'value' : [85, 1.75, 70] }
FeatureSet :
{ 'first name' : ['philip', 'anne'],
'measure': ['weight', 'height'] }
Index : [[0, 0], [0, 1], [1, 0]]

It can be automatically completed:

First name	*Measure*	*Value*
Philip	*Weight*	*85*
Philip	*Height*	*1.75*
Anne	*Weight*	*70*
Anne	*Height*	*-*

Result : { 'value' : [85, 1.75, 70] }
FeatureSet :
{ 'first name' : ['philip', 'anne'],
'measure': ['weight', 'height'] }
Index : implicit

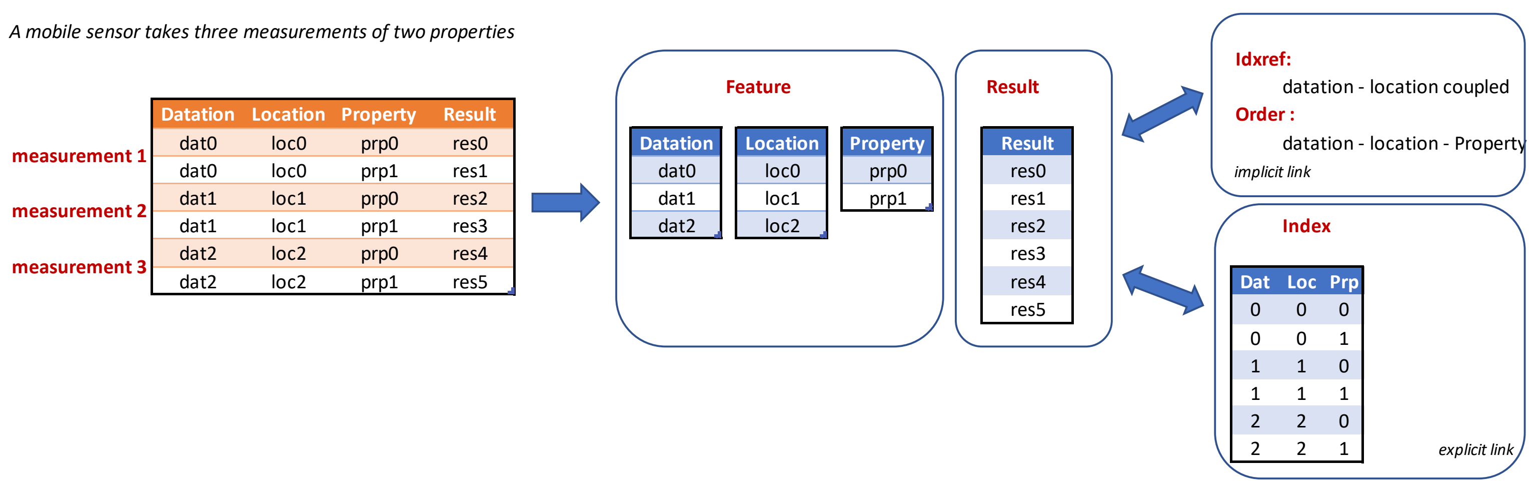
With trivial index, the FeatureSet will be : { 'first name' : ['philip', 'philip', 'anne'], 'measure': ['weight', 'height', 'weight'] and the index is implicit.

OBSERVATION JSON FORMAT

Observation example:

Example | **Representation** | **Indexing**

A mobile sensor takes three measurements of two properties



	Datation	Location	Property	Result
measurement 1	dat0	loc0	prp0	res0
	dat0	loc0	prp1	res1
measurement 2	dat1	loc1	prp0	res2
	dat1	loc1	prp1	res3
measurement 3	dat2	loc2	prp0	res4
	dat2	loc2	prp1	res5

Feature

Datation	Location	Property
dat0	loc0	prp0
dat1	loc1	prp1
dat2	loc2	

Result

Result
res0
res1
res2
res3
res4
res5

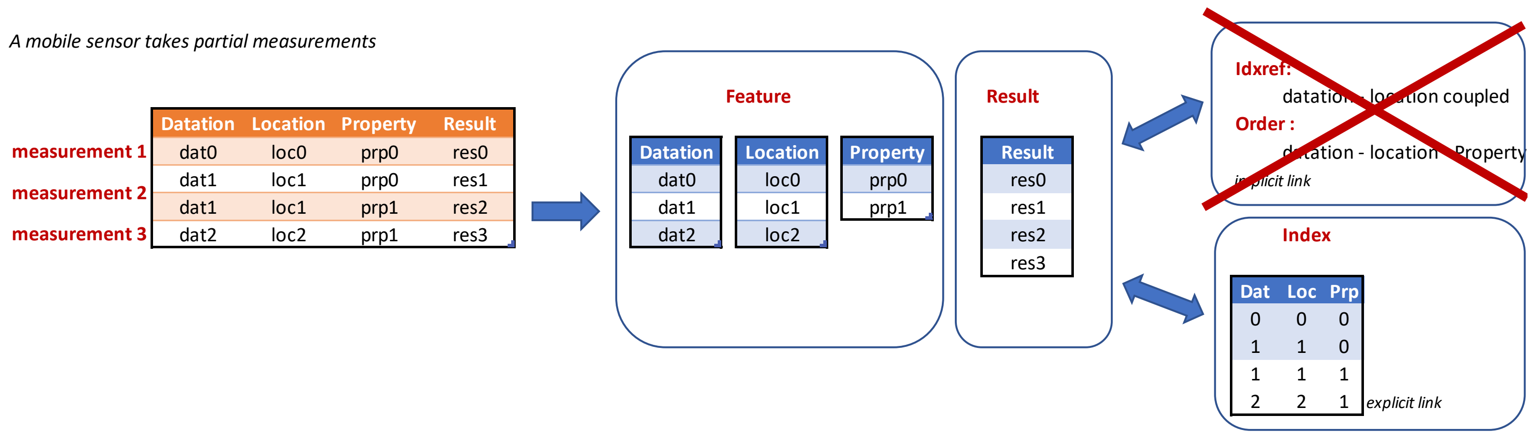
Idxref: datation - location coupled
Order : datation - location - Property
implicit link

Index

Dat	Loc	Prp
0	0	0
0	0	1
1	1	0
1	1	1
2	2	0
2	2	1

explicit link

A mobile sensor takes partial measurements



	Datation	Location	Property	Result
measurement 1	dat0	loc0	prp0	res0
measurement 2	dat1	loc1	prp0	res1
	dat1	loc1	prp1	res2
measurement 3	dat2	loc2	prp1	res3

Feature

Datation	Location	Property
dat0	loc0	prp0
dat1	loc1	prp1
dat2	loc2	

Result

Result
res0
res1
res2
res3

~~**Idxref:** datation - location coupled~~
~~**Order :** datation - location - Property~~
~~*implicit link*~~

Index

Dat	Loc	Prp
0	0	0
1	1	0
1	1	1
2	2	1

explicit link