Standards Council

Blockchain in Transport Alliance Standards Council (BiTAS)

BiTAS Std 120-2019: LOCATION COMPONENT SPECIFICATION

BiTAS Std. 120-2019: Location Component Specification

REVISION HISTORY

Version	Date	Author
BiTAS Std 120-2019 v1.0	February 27, 2019	Pratik Soni, BiTAS Tracking Data WG Chair

ACKNOWLEDGEMENTS

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CONVENTIONS

The Blockchain examples cited in this Specification are stored on a JSON string. An example of this format is: "ID" : "trackableEvent1

Figures and charts included in this specification are drafted using Unified Modelling Language (UML) class diagrams and charts. For more information on how to read the charts and diagrams in this Specification, please refer to Section 5: Component Model.

Contents

1.0 Foreword…7

2.0 Introduction …8

3.0 Scope…9

4.0 Normative references…9

5.0 Terms, abbreviations and definitions…9

6.0 Components…9

6.1 Common Elements/Attributes…9

6.1.1 Meta Data/Versioning…9

7.0 Location Component…10

7.1 Data Format… 10

7.2 Location Component and Position… 10

7.3 Custom Position Implementations… 13

7.4 Position…13

8.0 Future Revisions…14

1.0 Foreword

As the BiTAS Data Formats Technical Committee has set defining the Location Component a priority for the BiTA Standards Council, the BiTAS Location Component Work Group charter has empowered the group to establish and define a Location Component. In the course of developing the Specification and evaluating objectives, the Location Components Work Group considered deliverables, definitions, coordination/collaboration, milestones and timelines, priorities, future versions, technology agnosticism and Work Group and Technical Committee feedback.

1.0.a Deliverables

- Define the component
  - What is the definition of a Location component? Representative use cases include GPS, Standard Point Location Code, international addresses and national postal standards, electronic exchange formats and other applicable use cases and dependencies for support
  - What are the variations of the component? Standard formatting used for GPS locations used in applications, Address location structure that is flexible enough to solve for international addresses and standard formats (e.g., a variety of postal codes) the need, if any, to include lower levels of description of a location, for example, region, subdivision, structure, floor, and PO Box. Should the components also include "front door" or "back door" or "dock"?

- What are the valid configurations of the component? Examples of things to consider: -
  - What are the elements contained in the component?
  - Are their variations of the component based on a business use case?
  - What are the basic validation rules? (Are their character limitations? Is there a minimum/ maximum size?)
  - Are their limited values that can be used in the element?
  - Is the element always required for the component?

Examples of GPS Definition to Consider:

- Composed of two values – Latitude and Longitude, defined in decimal degrees, such as 43.040833
  - If the accuracy is available, representation of the values may use minutes and seconds as well, as long the calculation has occurred to convert the location into decimal format: Decimal degrees = X degrees + (Y minutes * 1/60) + (Z seconds * 1/3600)
- Other points for discussion
  - Should a timestamp be considered part of Location by default?
  - Is altitude or height an optional consideration?

1.0.b Coordination

As Location Components are identified that may influence other BiTAS deliverables, coordination with other existing BiTAS work groups could be necessary. If complex components are identified that require more in-depth definitions, work with the Data Format Technical Committee sponsor for guidance is warranted.

1.0.c Timeline/Milestones

The Location Component Work Group was chartered to achieve an initial draft of a Location Component Specification on or before November, 2018.

1.0.d Priority

The Work Group had to determine if document features can be delivered as iterations and identify the targeted iterations. Example: would a basic street address be beneficial without more in-depth details such as a floor?

1.0.e Future Revisions

It is well understood that community-driven standards development efforts are by their nature iterative. Starting from the initial draft, the Working Group(s) is encouraged to draft and share, not only with the Technical Committee but with other Working Groups. It is expected that these will be living documents until and after BiTAS ratification.

1.0.f Technology Agnosticism

The Working Group should develop definitions that are not vendor or ledger technology specific, and that do not unreasonably duplicate other standards organizations.

1.0.g Technical Committee Feedback

At agreed upon intervals, the Work Group will communicate their efforts to date, which will allow the BiTAS Technical Committee to provide feedback and guidance on overall goal alignment, document structure, and other areas needed to ensure a normative outcome with other Specification developing Work Groups.

2.0 Introduction

The Location Component is a data structure used whenever a geographic location needs to be recorded on the Blockchain. The Location Component, without any other information, contains all the information needed to determine a geographic location.

The Location Component is used to define the location of any type of object or entity regardless of whether it is fixed (e.g. a building, port, rail station, etc) or mobile (e.g. a vehicle or shipping container, etc).

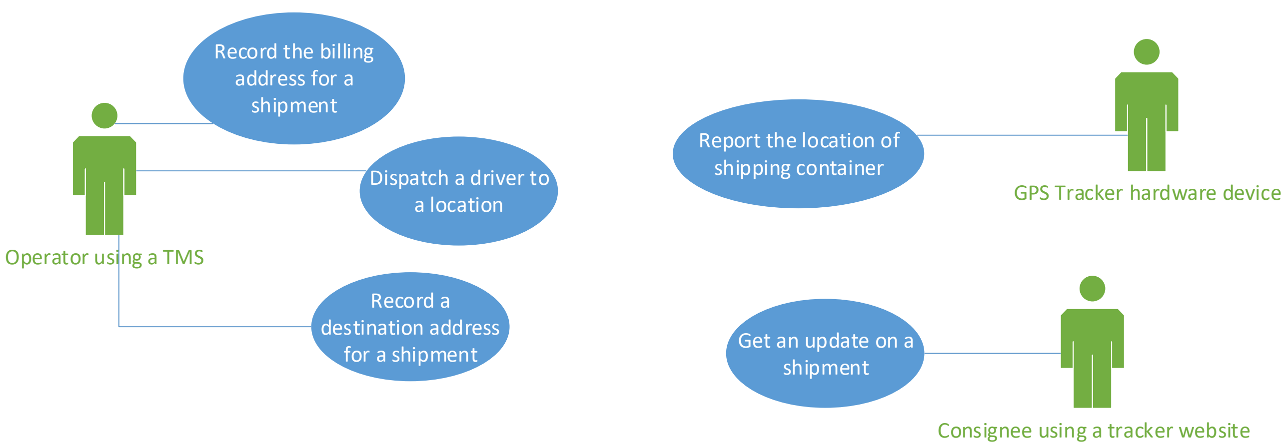

Figure 2: *Examples of Uses of Location Components*

A Location Component is a data structure that is always embedded within another data structure (the Parent Component). In other words, a Location Component can never exist in isolation on the blockchain. This is because the other data structure(s) define the accompanying data depending on the purpose of the Location Component. Examples of purposes are:

1. To track the location of a shipping container
2. To record the destination address of a shipment
3. To record the billing address of a customer for a shipment
4. To dispatch a driver to a location

3.0 Scope

The scope of the project was to define the baseline location components required to know where item/s are within its journey. Identify standard data elements & attributes known across multiple industries to form a starting data structure to publish a given component location with the ability to add custom and/or unique Position attributes that provide greater position accuracy.

4.0 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Codes for the representation of names of countries and their subdivisions Part 1: Country codes. ISO, 2013.

Standard Point Location Code, RAILINC

5.0 Terms, Abbreviations and Definitions

For the purposes of this document, the following terms and definitions apply:

Term or Abbreviation	Definition
AAR	Association of American Railroads
FRA	Federal Railroad Administration
SPLC	Standard Point Location Code
FSAC	Freight Station Accounting Code

6.0 Components

6.1 Common Elements/Attributes

The Work Group identified common location elements or attributes that initially define a location. As one goes further into the Position, additional attributes can define a location within a location.

6.2 Meta Data/Versioning

For given location and position versioning, the Work Group assumes the top-line meta-data remain untouched and referenced when updating location and position.

Meta Data attributes:

- ID: String
- Version: String
- reportedByID: String
- reportedByRole: String

7.0 Location Component

The Location Component is used to represent a geographic location. A Location Component always exists as a child component of another on the Blockchain (e.g. address).

7.1 Data Format

The Location Component is stored as a JSON string.

7.2 Location Component and Position

Refer to the Location Component entity model in Figure 2.

The Location Component consists of three parts:

1) **Name**: Which identifies the name of the location itself
2) **Qualifier**: A single or multiple qualifier (multiple qualifier's: address, GeoCoord, SPLIC, City, etc.)
3) **Positions**: Position count can have 0 or many positions. If a location position has more than 1 position, then a sub-class of positions is provided. This array contains 1 or more Position-implementing structures that each describe the location. When the array contains more than 1 structure, each structure is meant to represent the same location but using a different method (i.e. latitude/longitude vs postal address etc).

Multiple methods are supported in order to meet these goals:

a) Make the Location Component suitable for any industry and any use case.
b) Make the location readable by any third party needing the information. This makes the data more open, transparent and useable by as many authorized parties on the Blockchain.
c) Support the expansion of the Location Component specification in a backwards-compatible way as new industries/use cases come to light after first release.

In the end, these goals are intended to improve the adoption rates of this Specification.

For example, the rail industry has an industry-specific method of specifying locations called the SPLC. Third parties may not have the ability to interpret this data so railway operators publishing locations in SPLC formats have the ability to publish a second more widely-known method such as latitude/longitude.

Within the Position a precedence number which is optional (starting at 1 and incrementing from there) identifies the order in which structures are preferred. In other words, the structure with a Precedence value of 1 is the 'native' or preferred structure to use for determining the location. It is expected that data consumers within the industry will use the structure with Precedence 1 and ignore the others. Data consumers unable to interpret the structure (method) with Precedence 1 would move on to the structure with Precedence 2 but if that one also uses a method unfamiliar to them, then to 3, etc.

Position structure can contain nested structures including optional (nullable) nested structures to handle scenarios where a method for specifying a location may have instances where a detailed location is needed and others where a detailed location description is not needed (or possible). For example, a location at a Warehouse would have as the root position structure (the root implements Position), the postal address of the warehouse. Within that structure could be nested a warehouse zone identifying an area that the warehouse is sub-divided into. And within the Warehouse Zone structure could be nested a bin or shelf that might identify the specific location needed for a warehouse picker to locate an item

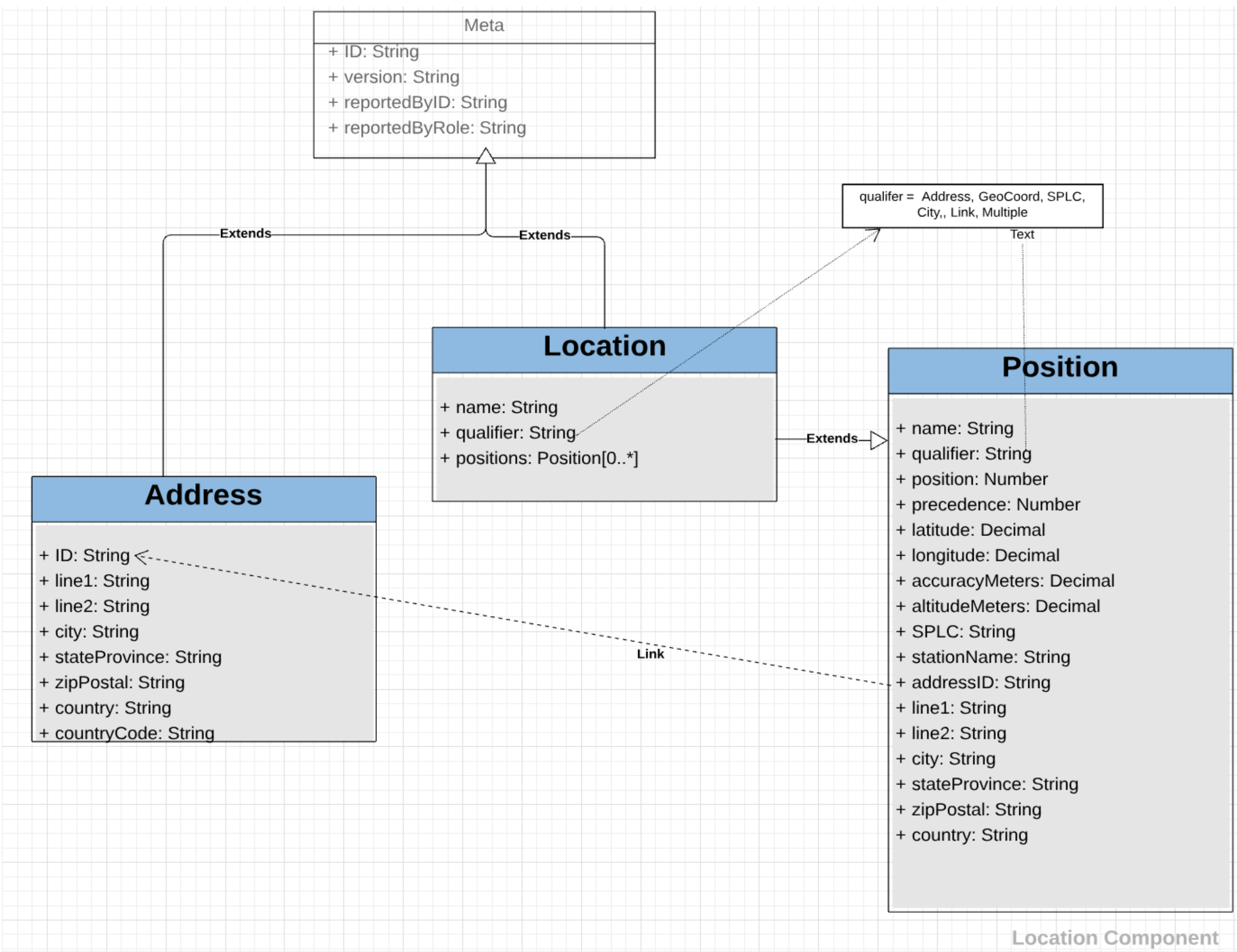

Figure 7: Location Component Entity Model.

If position Address is same as original address, position address can link the original address to remove duplication.

7.3 Custom Position Implementations

Users can create their own Position-implementing types that suit their industry requirements as long as they follow the rules in the BiTAS Industry-Specific Custom Data Type Specification. Custom Data Types must always have a Position greater than 1 and link to the standard Position data type included in the Location Component instance (for review with BiTAS Technical Committee).

7.4 Position

The Location Component is designed to meet these simultaneous needs:

1) Define a location using a methodology specific to an industry for the use by other parties within that industry
2) Define a location using a widely-known methodology for use by parties outside a specific industry
3) Define a location with varying degree of precision based on the particular need when used

Position is designed to support these needs.

<Design Example for Location (Simple)>

The simple Location Component contains a scenario where location is only a simple address and no relevant position information is required (see Figure 3).

```
// handle simple case
location =  {
    "ID" : "1234",
    "name": "SERVPROV-5_413-426",
    "qualifier" : "Address",
    "address1" : "2 ALPINE DR",
    "address2" : "",
    "city" : "CLOSTER",
    "stateProvince" : "NJ",
    "zipPostal" : "07624",
    "country" : "USA"
}
```

<Design Example for Location and Position (Complex)>

The complex Location Component contains a scenario where location and its relevant position is displayed based on precedence (see Figure 4). All position arrays are optional.

Position values also specify the order of position from most general to most detailed. This allows for an as detailed a position description as desired by the data-creator.

```
// more complex case

location = {
    "ID" : "1234",
    "name": "SERVPROV-5_413-426",
    "qualifier" : "Mulitple",

    "positions": [ // positions array begin
        {
            "position": 1,
            "qualifier" : "Address",
            "Address1" : "10 Alpine Dr",
            "Address2" : "",
            "City" : "Closter",
            "stateProvince" : "NJ",
            "zipPostal" : "07627",
            "country" : "USA"
        },
        {
            "position": 2,
            "qualifier" : "GeoCoord",
            "lattitude": 40.03657,
            "longitude": -75.38013,
            "accuracyMeters": 10,
            "altitudeMeters": 5
        },
        {
            "position": 3,
            "qualifier" : "SPLC",
            "SPLC": "NYK",
            "stationName": "Newark"
        },
        {
            "position": 4,
            "qualifier": "City",
            "City": "Closter",
            "stateProvince" : "NJ",
            "country": "USA"
        },
        {
            "position": 5,
            "qualifier": "Link",
            "addressID":  8907  // link to address shown below
        }
    ] // positions array end
} // location end
```

```
"address": {
    "ID":  8907,
    "address1" : "2 ALPINE DR",
    "address2" : "",
    "city" : "CLOSTER",
    "stateProvince" : "NJ",
    "zipPostal" : "07624",
    "country" : "USA"
}
```


8.0 Future Revisions

BiTAS has elected to initiate this Specification as it continues to refine a predefined list of attributes which will be incorporated into future versions of this specification.

The Location Component Work Group will work with the BiTAS Data FormatTechnical Committee to determine the best approach to incorporate new attributes above and beyond the 22 based attributes for location.