IoT Big Data Harmonised Data Model
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Table of Contents

1 Introduction 4
1.1 Overview 4
1.2 Scope 4
1.3 Abbreviations 4
1.4 References 4
2 Harmonised Data Models 5
2.1 Vertical Segments 5
2.2 Attribute types 5
2.2.1 ExtQuantitativeValue Attribute type 7
2.3 Generic Entity Data Model 8
2.3.1 AgriCrop 10
2.3.2 AgriGreenHouse 14
2.3.3 AgriParcel 18
2.3.4 AgriParcelOperation 21
2.3.5 AgriParcelRecord 25
2.3.6 AgriPest 29
2.3.7 AgriProduct 31
2.3.8 AgriProductType 34
2.3.9 AgriSoil 36
2.3.10 AirQualityObserved 38
2.3.11 Building 41
2.3.12 BuildingOperation 46
2.3.13 BuildingType 50
2.3.14 Device 52
2.3.15 DeviceModel 57
2.3.16 DeviceOperation 60
2.3.17 EnvironmentObserved 64
2.3.18 Machine 67
2.3.19 MachineModel 71
2.3.20 MachineOperation 75
2.3.21 PointOfInterest 79
2.3.22 Road 82
2.3.23 RoadSegment 84
2.3.24 Subscriber 87
2.3.25 SubscriptionService 90
2.3.26 Vehicle 92
2.3.27 VehicleFault 95
2.3.28 VehicleType 98
2.3.29 WaterQualityObserved 100
2.3.30 WeatherForecast 106
2.3.31 WeatherObserved 112
Annex A ExtQuantitativeValue and NGSIv2 metadata compatibility (Informative) 117

Annex B Referenced Schema.org entities (Informative) 118
B.1 Schema.org entity descriptions: Offer 118
B.2 Schema.org entity descriptions: Organisation 123
B.3 Schema.org entity descriptions: Person 126
B.4 Schema.org entity descriptions: PostalAddress 130
B.5 Schema.org entity descriptions: Product 131
B.6 Schema.org entity descriptions: QuantitativeValue 134
B.7 Schema.org entity descriptions: Vehicle 135
Annex C Document Management 139
C.1 Document History 139
C.2 Other Information 139

1 Introduction

1.1 Overview

Data interoperability has been identified [1] as a technical barrier that prohibits the realisation of the full potential value of IoT Big Data. To help address that problem, in this document data models are defined of entities or things that are commonly used in IoT Big Data applications. The definitions of the data entities have been developed through contributions from participating mobile operators and aligned with existing industry work and namespaces where possible, for example, oneM2M in Smart Home [2], OASC for Smart Cities [3] and schema.org [4] for generic entities.

These collaboratively developed harmonised data models, together with the accompanying documents "IoT Big Data Framework Architecture" [9] and "IoT Big Data NGSIv2 Profile" [10], aim to define a framework of how mobile operators can approach the delivery of IoT Big Data services.

All sections and appendixes, except "Scope" and "Introduction", are normative, unless they are explicitly indicated to be informative.

1.2 Scope

This document specifies harmonised data models that are approved for use by all the participants of the IoT Big Data Ecosystem Project.

The harmonised data models are expected to evolve over time, potentially new entities will be added and entity definitions changed. The harmonised entity definitions defined within this document will be published and accessible via the GSMA IoT Big Data API Directory and will be developed and maintained in a collaborative manner. Contributions are welcome from the wider IoT community to develop and update the data entities. In the short to medium term, these changes will be managed through the standard GSMA PRD process with the IoT Big Data project/PSMC being the approval authority.

1.3 Abbreviations

Term	Description
CNC	Computer Numerical Control
IoT	Internet of Things
IoTBD	Internet of Things Big Data
JSON	JavaScript Object Notation)
ppt	parts per thousand

1.4 References

Ref	Doc Number	Title
[1]		Unlocking the Value of IoT Through Big Data. http://www.gsma.com/connectedliving/unlocking-the-value-of-iot-through-big-data/
[2]	oneM2M	http://www.onem2m.org/

Ref	Doc Number	Title
[3]	OASC	http://oascities.org/
[4]	Schema.org	http://schema.org/
[5]	JSON	http://www.json.org/
[6]	FIWARE NGSIv2	FIWARE-NGSIv2 Specification available at http://fiware.github.io/specifications/ngsiv2/stable/
[7]	FIWARE DataModels	http://fiware-datamodels.readthedocs.io/en/latest/
[8]	Lower camel case	https://en.wikipedia.org/wiki/CamelCase
[9]	PRD CLP.25	IoT Big Data Framework Architecture
[10]	PRD CLP.24	IoT Big Data NGSIv2 Profile

2 Harmonised Data Models

2.1 Vertical Segments

The harmonised data entities contained in this document originate from and are used in the following industry verticals (or IoT Domains):

- Agriculture
- Automotive
- Environment
- Industry
- Smart City
- Smart Home

The data entity definitions include a list of the applicable industry verticals to assist with entity classification and discovery.

2.2 Attribute types

Attribute types used within this document broadly follow the JSON (JavaScript Object Notation) type specification [5], the NGSIv2 [6] type specification and the schema.org type specification [4] as tabulated below:

Attribute Type name	Usage
Array	An ordered list of values that are referenced by numerical index. There can be arrays containing elements which type corresponds to any of the types described below.
Boolean	Logical value of **true** or **false**.
Date	A sequence of characters using ISO 8601 encoding to represent a Date. (https://schema.org/Date)
DateTime	A sequence of characters using ISO 8601 encoding to represent a timestamp (date plus time). (https://schema.org/DateTime)

ExtQuantitativeValue	An extended collection of key value pairs describing a point value characteristic of an entity. Specifically adding a **timestamp** (the date and time or the observation) to the existing Quantitative Value as defined by schema.org. (https://schema.org/QuantitiativeValue)
geo:json	Defines a location specified using geo:json encoding. (https://tools.ietf.org/html/rfc7946)
Number	An integer or floating point number. (https://schema.org/Number)
Offer	An offer definition for goods or services as defined by schema.org. (https://schema.org/Offer)
Organization	An organisation definition as defined by schema.org.(https://schema.org/Organization)
Person	A person definition as defined by schema.org.(https://schema.org/Person)
Place	A place definition as defined by schema.org.(https://schema.org/Place)
PostalAddress	A Postal Address of an item as defined by schema.org. (https://schema.org/PostalAddress)
Product	A product definition as defined by schema.org. (https://schema.org/Product)
QuantitativeValue	A collection of key value pairs describing a point value characteristic of an entity or attribute as defined by schema.org. (https://schema.org/QuantitiativeValue)
Reference	A sequence of characters which represents a reference to another entity.
StructuredValue	A collection of key value pairs. Values may themselves be a Text, Number, Boolean, Array, StructuredValue or DateTime as defined by schema.org. (https://schema.org/StructuredValue)
Text	A sequence of characters. (https://schema.org/Text)
Time	A sequence of characters using ISO 8601 encoding to represent a Time. (https://schema.org/Time)
URL	A sequence of characters. Defining a URL. (https://schema.org/URL)

In addition, all the entities defined in this document are valid attribute types.

2.2.1 ExtQuantitativeValue Attribute type

The ExtQuantitativeValue attribute type is defined below:

Property	Expected Type	Description
Properties from ExtQuantitativeValue		
additionalProperty	PropertyValue	A property-value pair representing an additional characteristics of the entity, e.g. a product feature or another characteristic for which there is no matching property in schema.org. Note: Publishers should be aware that applications designed to use specific schema.org properties (e.g. http://schema.org/width, http://schema.org/color, http://schema.org/gtin13, ...) will typically expect such data to be provided using those properties, rather than using the generic property/value mechanism.
maxValue	Number	The upper value of some characteristic or property.
minValue	Number	The lower value of some characteristic or property.
Timestamp*	DateTime	The ISO8601 sequence of characters at which the observation was made in UTC.
unitCode	Text or URL	The unit of measurement given using the UN/CEFACT Common Code (3 characters) or a URL. Other codes than the UN/CEFACT Common Code may be used with a prefix followed by a colon.
unitText	Text	A string or text indicating the unit of measurement. Useful if you cannot provide a standard unit code for unitCode.
value	Boolean or Number or StructuredValue or Text	The value of the quantitative value or property value node. • For QuantitativeValue and MonetaryAmount, the recommended type for values is 'Number'. • For PropertyValue, it can be 'Text;', 'Number', 'Boolean', or 'StructuredValue'.
valueReference	Enumeration or PropertyValue or QualitativeValue or QuantitativeValue or StructuredValue	A pointer to a secondary value that provides additional information on the original value, e.g. a reference temperature.

*the timestamp field is the only additional property to the schema.org QuantitativeValue

The ExtQuantitativeValue attribute type has an equivalent format rendered using NGSIv2 attribute value and metadata, the alternate format, equivalence and compatibility are explained in further details in Annex A

2.3 Generic Entity Data Model

This generic entity Data Model enables each instance of an entity or thing to be uniquely described using an agreed set of harmonised attributes in a uniform and consistent way. All the entities defined in this section are normative.

In this document we follow this entity definition convention:

Common mandatory attributes are always presented first and by definition are included in all entities. These are followed by entity specific mandatory attributes and finally entity specific optional attributes. Attribute naming will follow the lower camel case convention [8]. Generic entity definitions are taken from the schema.org [4] vocabulary wherever possible.

<Entity Name><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/Optional	May be Null
id	Text	Unique id of this instance of this entity. A globally unique reference to this entity instance. It is recommended ids comply with RFC4122.	M	N
type	Text	The type of the entity. A choice of one of the entity types defined in this document.	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity. A null value in this field means the entity has not been modified since being created.	M	Y
source	URL	A sequence of characters giving the original source of the entity data as a URL. Recommended to be the fully qualified domain name of the source provider, or the URL to the source object.	M	Y
dataProvider	Text	A sequence of characters identifying the provider of the harmonised data entity.	M	Y

In addition to the generic entity attributes which are common to all entities, there are a set of entity specific attributes. In this document the entity specific attributes are listed for convenience in a separate table per entity as shown below:

<Entity Name><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
specificMan1	A valid attribute type	Some text describing a mandatory attribute which may not be null.	M	N
specificManN	A valid attribute type	Some text describing a mandatory attribute which may be null.	M	Y
specificOptN	A valid attribute type	Some text describing an optional attribute which may be null.	O	Y

The combination of <Entity Name><Generic Attributes> and <Entity Name><Entity Specific Attributes> provides the definition of the complete harmonised data model of an Entity.

2.3.1 AgriCrop

This entity contains a harmonised description of a generic crop. This entity is primarily associated with the agricultural vertical and related IoT applications.

<AgriCrop><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`AgriCrop`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	M	Y
source	URL	A sequence of characters giving the source of the entity data as a URL.	M	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	M	Y

<AgriCrop><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
name	Text	The name of this crop.	M	N
alternateName	Text	An alternative name for this crop.	O	Y
description	Text	A description of this crop.	O	Y
refAgriSoil	Array of Reference	An array containing a JSON encoded sequence of characters that reference the unique Ids of the recommended soil(s).	O	Y
refAgriFertilizer	Array of Reference	An array containing a JSON encoded sequence of characters that reference the unique Ids of the recommended fertiliser product(s).	O	Y
refAgriPest	Array of Reference	An array containing a JSON encoded sequence of characters that reference the unique Ids of the pest(s) known to attack this crop.	O	Y
plantingInterval	Array of Text	An array containing a JSON encoded sequence of characters of the recommended planting interval date(s)	O	Y

		for this crop. Using The ISO8601 sequence of characters for each repeating date interval: **`interval`**, **`description`** Where **`interval`** is in the form of start date/end date --MM-DD/--MM-DD Meaning repeat each year from this start date to this end date.		
harvestingInterval	Array of Text	An array containing a JSON encoded sequence of characters of the recommended harvesting interval date(s) for this crop. Using The ISO8601 sequence of characters for each repeating date interval: **`interval`** , **`description`** Where **`interval`** is in the form of start date/end date --MM-DD/--MM-DD Meaning repeat each year between the specified start date and the specified end date.	O	Y
wateringFrequency	Text	A description of the recommended watering schedule. A choice from an enumerated list. One of: **`daily, weekly, biweekly, monthly, onDemand, other`**	O	Y

2.3.1.1 AgriCrop JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/00685ca0edd54411cad5be84ee658da8


```
{
  "id": "df72dc57-1eb9-42a3-88a9-8647ecc954b4",
  "type": "AgriCrop",
  "dateCreated": {
    "value": "2016-08-22T19:20+00:00",
    "type": "DateTime"
  },
  "dateModified": {
    "value": "2016-08-22T19:20+00:00",
    "type": "DateTime"
  },
  "source": {
    "value": "http://www.samplefarmproduct.com",
    "type": "URL"
  },
  "dataProvider": {
    "value": "OperatorA",
    "type": "Text"
  },
  "name": {
    "value": "Wheat",
    "type": "Text"
  },
  "alternateName": {
    "value": "Triticum aestivum",
    "type": "Text"
  },
  "description": {
    "value": "Spring wheat",
    "type": "Text"
  },
  "refAgriSoil": [
    "00411b56-bd1b-4551-96e0-a6e7fde9c840",
    "e8a8389a-edf5-4345-8d2c-b98ac1ce8e2a"
  ],
  "refAgriFertilizer": [
    "1b0d6cf7-320c-4a2b-b2f1-4575ea850c73",
    "380973c8-4d3b-4723-a899-0c0c5cc63e7e"
  ],
  "refAgriPest": [
    "10b52f07-079a-4390-8237-bf6a1c049a85",
    "66bdb09b-4fe0-4932-a267-f9eda4474d2a"
  ],
  "plantingInterval": [
    "-09-28/-10-12, Best Season",
    "-10-11/-10-18, Season OK"
  ],
  "harvestingInterval": [
```

```
    "-03-21/-04-01, Best Season",
    "-04-02/-04-15, Season OK"
  ],
  "wateringFrequency": {
    "value": "weekly",
    "type": "Text"
  }
}
```

2.3.2 AgriGreenHouse

This entity contains a harmonised description of the conditions recorded within a generic greenhouse, a type of AgriParcel. This entity is primarily associated with the agricultural vertical and related IoT applications.

<AgriGreenHouse><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`AgriGreenHouse`**"	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	M	Y
source	URL	A sequence of characters giving the source of the entity data as a URL.	M	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	M	Y

<AgriGreenHouse><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
refAgriParcel	Reference	Reference to the Unique id of the AgriParcel to which this record relates.	M	N
refWeatherObserved	Reference	A JSON encoded sequence of characters that reference the unique id of the related weather observed record.	O	Y
relativeHumidity	ExtQuantitativeValue (Number)	The inside relative humidity expressed as a number between 0 and 1. $0 \leqslant$ relativeHumidity $\leqslant 1$ Encoded as a ExtQuantitiativeValue	O	Y
refAgriParcelRecord	Array of Reference	Related AgriParcelRecords for this greenhouse.	O	Y
leafTemperature	ExtQuantitativeValue(Number)	The average greenhouse air temperature in degrees centigrade. Encoded as a ExtQuantitiativeValue.	O	Y

co2	ExtQuantitativeValue(Number)	The inside C02 concentration in mg/L. Encoded as a ExtQuantitativeValue.	O	Y
dailyLight	ExtQuantitativeValue (Number)	Daily Accumulated light measured in kW/m^2 Encoded as a ExtQuantitativeValue.	O	Y
drainFlow	ExtQuantitativeValue (Number)	The observed drain flow rate in litres per second encoded as a ExtQuantitativeValue.	O	Y
refWaterQualityObserved	Array of Reference	Reference to the id(s) of the WaterQualityObserved records relating to this greenhouse.	O	Y

2.3.2.1 AgriGreenHouse JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/ba3f1acd21bd476600ad0f4a21f1260b


```
{
  "id": "ad500806-05ea-4ab6-812a-7a315d98e88d",
  "type": "AgriGreenHouse",
  "dateCreated": {
    "value": "2016-08-22T10:18:16Z",
    "type": "DateTime"
  },
  "dateModified": {
    "value": "2016-08-22T10:18:16Z",
    "type": "DateTime"
  },
  "source": {
    "value": "http://www.samplefarmproduct.com",
    "type": "URL"
  },
  "dataProvider": {
    "value": "OperatorA",
    "type": "Text"
  },
  "refAgriParcel": {
    "value": "c8b475e5-84a8-4346-ad79-cde1d2a4028b",
```

```
    "type": "Reference"
  },
  "refWeatherObserved": {
    "value": "c720cec5-ac6f-40b7-8e89-becb75702d0d",
    "type": "Reference"
  },
  "relativeHumidity": {
    "value": {
      "value": 0.4,
      "unitCode": "RA",
      "timestamp": "2016-08-22T19:20+00:00"
    },
    "type": "ExtQuantitativeValue"
  },
  "refAgriParcelRecord": [
    "8c3a525d-b42e-4048-bcdd-a119d8ddb0a5",
    "178d74c1-e6fe-4042-b955-2c164fc90b83"
  ],
  "leafTemperature": {
    "value": {
      "value": 22,
      "unitCode": "CEL",
      "timestamp": "2016-08-22T19:20+00:00"
    },
    "type": "ExtQuantitativeValue"
  },
  "co2": {
    "value": {
      "value": 28,
      "unitCode": "M1",
      "timestamp": "2016-08-22T19:20+00:00"
    },
    "type": "ExtQuantitativeValue"
  },
  "dailyLight": {
    "value": {
      "value": 24,
      "unitCode": "N78",
      "timestamp": "2016-08-22T19:20+00:00"
    },
```

```
    "type": "ExtQuantitativeValue"
  },
  "drainFlow": {
    "type": "ExtQuantitativeValue",
    "value": {
      "value": 33,
      "maxValue": 50,
      "minValue": 25,
      "unitCode": "G51",
      "unitText": "Litre per second",
      "timestamp": "2016-08-22T19:20+00:00"
    }
  },
  "refWaterQualityObserved": [
    "49f86e0b-bb90-4751-a1c3-d5a891920807"
  ]
}
```

2.3.3 AgriParcel

This entity contains a harmonised description of a generic parcel of land. This entity is primarily associated with the agricultural vertical and related IoT applications.

<AgriParcel><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`AgriParcel`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	M	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	M	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	M	Y

<AgriParcel><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
location	geo:json	The geo:json encoded polygon describing this parcel.	M	N
area	Number or ExtQuantitativeValue (Number)	The area of the parcel in square meters encoded as a number or a ExtQuantitativeValue.	M	N
description	Text	A description of the parcel.	O	Y
category	Array	A choice from an enumerated list describing the parcel category. **`greenhouse, irrigated, rainfed.`**	O	Y
refAgriCrop	Reference	A reference to the unique id of the AgriCrop associated with this Parcel.	M	N
cropStatus	Text	A choice from an enumerated list describing the crop planting status One of:	O	Y

		seeded, justBorn, growing, maturing, readyForHarvesting.		
refAgriSoil	Reference	A reference to the unique id of the soil associated with this Parcel.	O	Y
dateLastPlanted	DateTime	The ISO8601 sequence of characters at which the AgriCrop was planted in UTC.	O	Y
refDevice	Array of Reference	A reference to the unique ids of the Devices used to monitor this parcel.	O	Y

2.3.3.1 AgriParcel JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/80f69a2558080798d6e661122d3f0cf8


```
{
  "id": "72d9fb43-53f8-4ec8-a33c-fa931360259a",
  "type": "AgriParcel",
  "dateCreated": {
    "value": "2016-08-22T10:18:16Z ",
    "type": "DateTime"
  },
  "dateModified": {
    "value": "2016-08-22T10:18:16Z ",
    "type": "DateTime"
  },
  "source": {
    "value": "http://www.samplefarmproduct.com",
    "type": "URL"
  },
  "dataProvider": {
    "value": "OperatorA",
    "type": "Text"
  },
  "location": {
    "value": {
      "type": "Polygon",
      "coordinates": [
        [100, 0],
        [101, 0],
        [101, 1],
        [100, 1],
```

```
        [100, 0]
      ]
    },
    "type": "geo:json"
  },
  "area": {
    "value": 2000,
    "type": "Number"
  },
  "description": {
    "value": "North greenhouse (glass)",
    "type": "Text"
  },
  "category": [
    "greenhouse"
  ],
  "refAgriCrop": {
    "value": "af3b2a4f-3133-4747-8e00-ba5e4cf1708b",
    "type": "Reference"
  },
  "cropStatus": {
    "value": "seeded",
    "type": "Text"
  },
  "refAgriSoil": {
    "value": "791f80c4-d621-4686-9bc0-84487084b9cf",
    "type": "Reference"
  },
  "dateLastPlanted": {
    "value": "2016-08-09T10:18:16Z",
    "type": "DateTime"
  },
  "refDevice": [
    "276805ff-d3fb-41bf-9714-ed0ecf2ee12b",
    "59b241f5-2827-44ea-bd1f-938567d271ea"
  ]
}
```

2.3.4 AgriParcelOperation

This entity contains a harmonised description of a generic operations performed on a parcel of land. This entity is primarily associated with the agricultural vertical and related IoT applications.

<AgriParcelOperation><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`AgriParcelOperation`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	M	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	M	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	M	Y

<AgriParcelOperation><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
refAgriParcel	Reference	A reference to the unique id of the AgriParcel related to this operation.	M	N
operationType	Text	A choice from an enumerated list describing the operation performed on the parcel. One of: **`fertiliser, inspection, pesticide, water, other.`**	O	Y
description	Text	A description of the operation.	O	Y
result	Text	A description of the results of the operation. One of (“ok”, “aborted”).	O	Y
startDate	DateTime	The planned start date for the operation.	M	Y
endDate	DateTime	The planned end date for the operation.	M	Y
status	Text	A choice from an enumerated list describing the status. One of:	O	Y

		planned, ongoing, finished, scheduled, cancelled.		
operator	Person	The operator performing this action encoded as a Schema.org person. https://schema.org/Person	O	Y
dateStarted	DateTime	Timestamp when the operation actually started to be performed.	O	Y
dateFinished	DateTime	Timestamp when the operation actually finished.	O	Y
refAgriProduct	Reference	A reference to the unique id of the AgriProduct used.	O	Y
quantity	ExtQuantitativeValue(Number)	The amount of water or product used encoded as a ExtQuantitativeValue.	O	Y
waterSource	Text	A choice from an enumerated list describing the water source. One of: **rainfall, watering.**	O	Y

2.3.4.1 AgriParcelOperation JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/52a05ec2f4d55181cec3f1aba6157a1d

```
{
  "id": "e1e9d3a3-074f-46f1-9375-52000d05a62b",
  "type": "AgriParcelOperation",
  "dateCreated": {
    "value": "2016-08-22T10:18:16Z",
    "type": "DateTime"
  },
  "dateModified": {
    "value": "2016-08-22T10:18:16Z",
    "type": "DateTime"
  },
  "source": {
    "value": "http://www.samplefarmproduct.com",
    "type": "URL"
  },
  "dataProvider": {
```

```
    "value": "OperatorA",
    "type": "Text"
  },
  "refAgriParcel": {
    "value": "318366a9-7643-4d8e-9a11-c76a8c29d8eb",
    "type": "Reference"
  },
  "operationType": {
    "value": "fertiliser",
    "type": "Text"
  },
  "description": {
    "value": "Monthly fertiliser application",
    "type": "Text"
  },
  "result": {
    "value": "Completed successfully ",
    "type": "Text"
  },
  "startDate": {
    "value": "2016-08-22T10:18:16Z",
    "type": "DateTime"
  },
  "endDate": {
    "value": "2016-08-28T10:18:16Z",
    "type": "DateTime"
  },
  "status": {
    "value": "ongoing",
    "type": "Text"
  },
  "operator": {
    "value": {
      "givenName": "John Smith",
      "jobTitle": "Tractor Operator"
    },
    "type": "Person"
  },
  "dateStarted": {
    "value": "2016-08-22T10:18:16Z",
```

```
    "type": "DateTime"
  },
  "dateFinished": {
    "value": "2016-08-28T10:18:16Z",
    "type": "DateTime"
  },
  "refAgriProduct": {
    "value": "a8f616b8-13fb-473a-8e61-b7a80c6c93ec",
    "type": "Reference"
  },
  "quantity": {
    "value": {
      "value": 40,
      "unitCode": "GM"
    },
    "type": "ExtQuantitativeValue"
  },
  "waterSource": {
    "value": "watering",
    "type": "Text"
  }
}
```

2.3.5 AgriParcelRecord

This entity contains a harmonised description of the conditions recorded on a generic parcel of land. This entity is primarily associated with the agricultural vertical and related IoT applications.

<AgriParcelRecord><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`AgriParcelRecord`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	M	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	M	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	M	Y

<AgriParcelRecord><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
refAgriParcel	Reference	Unique id of the AgriParcel to which this record relates.	M	N
location	geo:json	The geo:json encoded polygon of this AgriParcelRecord.	M	N
soilTemperature	ExtQuantitativeValue(Number)	The observed soil temperature in degrees centigrade encoded as a ExtQuantitativeValue.	O	Y
temperature	ExtQuantitativeValue(Number)	The observed air temperature in degrees centigrade encoded as a ExtQuantitativeValue.	O	Y
soilMoistureVwc	ExtQuantitativeValue(Number)	Measured as Volumetric Water Content, VWC as a percentage. $0 \leqslant$ soilMoistureVwc $\leqslant 100$ encoded as a ExtQuantitativeValue	O	Y

soilMoistureEc	ExtQuantitativeValue(Number)	Measured as Electrical Conductivity, EC in units of Siemens per meter (S/m) encoded as a ExtQuantitativeValue	O	Y
solarRadiation	ExtQuantitativeValue (Number)	Measured in kW/m^2 encoded as a ExtQuantitativeValue.	O	Y
relativeHumidity	ExtQuantitativeValue(Number)	Relative Humidity a number between 0 and 1 0 ⩽ relativeHumidity ⩽ 1 encoded as a ExtQuantitativeValue.	O	Y
atmosphericPressure	ExtQuantitativeValue(Number)	Atmospheric Pressure in units of Hecto Pascal encoded as a ExtQuantitativeValue.	O	Y
description	Text	Description of this AgriParcelRecord.	O	Y

2.3.5.1 AgriParcelRecord JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/bc089529b7966099cd11bc0e2b0bb283

```
{
  "id": "8f5445e6-f49b-496e-833b-e65fc97fcab7",
  "type": "AgriParcelRecord",
  "dateCreated": {
    "value": "2016-08-22T10:18:16Z",
    "type": "DateTime"
  },
  "dateModified": {
    "value": "2016-08-22T10:18:16Z",
    "type": "DateTime"
  },
  "source": {
    "value": "http://www.samplefarmproduct.com",
    "type": "URL"
  },
  "dataProvider": {
    "value": "OperatorA",
    "type": "Text"
  },
  "refAgriParcel": {
```

```
    "value": "d3676010-d815-468c-9e01-25739c5a25ed",
    "type": "Reference"
  },
  "location": {
    "value": {
      "type": "Polygon",
      "coordinates": [
        [100, 0],
        [101, 0],
        [101, 1],
        [100, 1],
        [100, 0]
      ]
    },
    "type": "geo:json"
  },
  "soilTemperature": {
    "value": {
      "value": 27,
      "unitCode": "CEL"
    },
    "type": "ExtQuantitativeValue"
  },
  "temperature": {
    "value": {
      "value": 33,
      "unitCode": "CEL"
    },
    "type": "ExtQuantitativeValue"
  },
  "soilMoistureVwc": {
    "value": {
      "value": 8,
      "unitCode": "P1"
    },
    "type": "ExtQuantitativeValue"
  },
  "soilMoistureEc": {
    "value": {
      "value": 17,
```

```
      "unitCode": "D10"
    },
    "type": "ExtQuantitativeValue"
  },
  "solarRadiation": {
    "value": {
      "value": 15,
      "unitCode": "N78"
    },
    "type": "ExtQuantitativeValue"
  },
  "relativeHumidity": {
    "value": {
      "value": 0.15
    },
    "type": "ExtQuantitativeValue"
  },
  "atmosphericPressure": {
    "value": {
      "value": 101325,
      "unitCode": "PAL"
    },
    "type": "ExtQuantitativeValue"
  },
  "description": {
    "value": "North greenhouse. Planting zone A ",
    "type": "Text"
  }
}
```

2.3.6 AgriPest

This entity contains a harmonised description of a generic agricultural pest. This entity is primarily associated with the agricultural vertical and related IoT applications.

<AgriPest><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`AgriPest`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	M	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	M	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	M	Y

<AgriPest><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
name	Text	The name of this agricultural pest.	M	N
alternateName	Text	Alternative name of this agricultural pest.	O	Y
description	Text	A description of this agricultural pest.	O	Y
refAgriProduct	Array of Reference	An array containing a JSON encoded sequence of characters referencing the unique ids of the recommended AgriProduct pesticide(s).	O	Y

2.3.6.1 AgriPest JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/cbab7c37630eb7ea87b503267d0696a1

```
{
  "id": "fb3f1295-500c-4aa3-b995-c909097d5c01",
  "type": "AgriPest",
  "dateCreated": {
```

```
    "value": "2016-08-22T10:18:16Z",
    "type": "DateTime"
  },
  "dateModified": {
    "value": "2016-08-22T10:18:16Z",
    "type": "DateTime"
  },
  "source": {
    "value": "http://www.samplefarmproduct.com",
    "type": "URL"
  },
  "dataProvider": {
    "value": "OperatorA",
    "type": "Text"
  },
  "name": {
    "value": "Grasshopper",
    "type": "Text"
  },
  "alternateName": {
    "value": "Chorthippus parallelus",
    "type": "Text"
  },
  "description": {
    "value": "Common European grasshopper",
    "type": "Text"
  },
  "refAgriProduct": [
    "7f1d962b-0d14-479b-a50a-baaef261263a"
  ]
}
```

2.3.7 AgriProduct

This entity contains a harmonised description of a generic agricultural product. This entity is primarily associated with the agricultural vertical and related IoT applications.

<AgriProduct><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`AgriProduct`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	M	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	M	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	M	Y

<AgriProduct><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
name	Text	The name of this agricultural product.	M	N
refAgriProductType	Reference	Unique id of this product type. Selected from AgriProductType.	M	N
description	Text	A description of this agricultural product.	O	Y
manufacturerName	Text	The name of manufacturer of this agricultural product.	O	Y
brandName	Text	A description of this agricultural product brand name.	O	Y
supplierName	Text	The details of the local retailer of this agricultural product.	O	Y
category	Array	A choice from an enumerated list. including: **`fertiliser, herbicide, pesticide, other`**	O	Y

2.3.7.1 AgriProduct JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/73d3eb307e8b2431fed1b7c91248c32a


```
{
  "id": "410ee08d-805e-4aab-9fba-065533b7bd76",
  "type": "AgriProduct",
  "dateCreated": {
    "value": "2016-08-22T10:18:16Z",
    "type": "DateTime"
  },
  "dateModified": {
    "value": "2016-08-22T10:18:16Z",
    "type": "DateTime"
  },
  "source": {
    "value": "http://www.samplefarmproduct.com",
    "type": "URL"
  },
  "dataProvider": {
    "value": "OperatorA",
    "type": "Text"
  },
  "name": {
    "value": "Banana seedlings",
    "type": "Text"
  },
  "refProductType": {
    "value": "ec6de3dc-7668-11e6-9c73-f752f61f61f9",
    "type": "Reference"
  },
  "description": {
    "value": "Banana cultivar Musa acuminata",
    "type": "Text"
  },
  "manufacturerName": {
    "value": "ACME Banana Supplies Company Ltd",
    "type": "Text"
  },
  "brandName": {
```

```
    "value": "5ADay",
    "type": "Text"
  },
  "supplierName": {
    "value": "A&B Wholesaling Limited",
    "type": "Text"
  },
  "category": [
    "other"
  ]
}
```

2.3.8 AgriProductType

This entity contains a harmonised description of a generic agricultural product type. This entity is primarily associated with the agricultural vertical and related IoT applications. The AgriProductType includes a hierarchical structure that allows product types to be grouped in a flexible way.

<AgriProductType><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`AgriProductType`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	M	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	M	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	M	Y

<AgriProductType><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
name	Text	The name of this AgriProductType.	M	N
description	Text	A description of this AgriProductType.	M	N
root	Boolean	A logical indicator that this product is the root of a AgriProductType hierarchy. Logical TRUE indicates it is a root.	M	N
refParentType	Array of Reference	A JSON encoded sequence of characters referencing the unique ids of the AgriProductType groupings this AgriProductType is a member of.	O	Y

2.3.8.1 AgriProductType JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/e78f090452ce8f63adfba472fe43c5d7

```
{
  "id": "398aa5f4-6a81-4dea-9f85-e9869441a257",
```

```
  "type": "AgriProductType",
  "dateCreated": {
    "value": "2016-08-22T10:18:16Z",
    "type": "DateTime"
  },
  "dateModified": {
    "value": "2016-08-22T10:18:16Z",
    "type": "DateTime"
  },
  "source": {
    "value": "http://www.samplefarmproduct.com",
    "type": "URL"
  },
  "dataProvider": {
    "value": "OperatorA",
    "type": "Text"
  },
  "name": {
    "value": "Soft Fruits",
    "type": "Text"
  },
  "description": {
    "value": "Soft edible fruits",
    "type": "Text"
  },
  "root": {
    "value": "FALSE",
    "type": "Text"
  },
  "refParentType": [
    "b99c940d-7156-4280-9a2b-4a9e533cd20e"
  ]
}
```

2.3.9 AgriSoil

This entity contains a harmonised description of soil. This entity is primarily associated with the agricultural vertical and related IoT applications.

<AgriSoil><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`AgriSoil`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	M	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	M	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	M	Y

<AgriSoil><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
name	Text	The name of this soil type.	M	N
alternateName	Text	Alternative name of this soil type.	O	Y
description	Text	A description of this soil.	O	Y
refAgriProduct	Array of Reference	An array containing a JSON encoded sequence of characters referencing the unique ids of the recommended AgriProduct fertiliser (or other) product(s).	O	Y

2.3.9.1 AgriSoil JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/3df400c35ce449a78ae5124ce07d99ce

```
{
  "id": "789363b4-c771-43d6-8505-ca582efe8fcd",
  "type": "AgriSoil",
  "dateCreated": {
```

```
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "dateModified": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "source": {
    "value": "http://www.samplefarmproduct.com",
    "type": "URL"
  },
  "dataProvider": {
    "value": "OperatorA",
    "type": "Text"
  },
  "name": {
    "value": "Clay",
    "type": "Text"
  },
  "alternateName": {
    "value": "Heavy soil",
    "type": "Text"
  },
  "description": {
    "value": "Fine grained, poor draining soil. Particle size less
than 0.002mm",
    "type": "Text"
  },
  "refAgriProduct": [
    "ea54eedf-d5a7-4e44-bddd-50e9935237c0",
    "275b4c08-5e52-4bb7-8523-74ce5d0007de"
  ]
}
```

2.3.10 AirQualityObserved

This entity contains a harmonised description of the air quality observed at a particular location and time. This entity is primarily associated with the vertical segment of the environment and may also be used in smart homes, smart cities, agriculture, industry and related IoT applications.

<AirQualityObserved><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`AirQualityObserved`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	M	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	M	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	M	Y

<AirQualityObserved><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
refDevice	Array of Reference	An array of references to the unique ids of the devices that originated this observation.	O	N
location	geo:json	The geo:json encoded polygon or point location, of this observation.	M	N
dateObserved	DateTime	The date and time of this observation in ISO8601 UTCformat.	M	N
measurand	Array of Text	An array containing a JSON encoded sequence of characters of the measurand observed. **`measurand`** , **`observedValue`**, **`unitcode`**, **`description`**. Unitcode defined as in schema.org/QuantitativeValue	M	Y

		The unit of measurement given using the UN/CEFACT Common Code (3 characters) http://wiki.goodrelations-vocabulary.org/Documentation/UN/CEFACT_Common_Codes Example; **"CO,500,M1,Carbon Monoxide"** **"NO,45,M1,Nitrogen Monoxide"** **"NO2,69,M1,Nitrogen Dioxide"** **"NOx,139,M1,Nitrogen oxides"** **"SO2,11,M1,Sulfur Dioxide"**		

2.3.10.1 AirQualityObserved JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/95ae1e455d471443c1a7af72e26e3fe2


```
{
  "id": "c9f32b35-a185-48e2-835f-c521efc294ab",
  "type": "AirQualityObserved",
  "dateCreated": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "dateModified": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "source": {
    "value": "http://www.example.com",
    "type": "URL"
  },
  "dataProvider": {
    "value": "OperatorA",
    "type": "Text"
  },
  "refDevice": [
    "5c9fb9dd-fc13-4fda-8f4c-f99a04f6f858"
```

```
  ],
  "location": {
    "value": {
      "type": "Point",
      "coordinates": [
        -104.99404,
        39.75621
      ]
    },
    "type": "geo:json"
  },
  "dateObserved": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "measurand": [
    "CO, 500, M1, Carbon monoxide concentration",
    "CO2, 1500, M1, Carbon dioxide concentration"
  ]
}
```

2.3.11 Building

This entity contains a harmonised description of a Building. This entity is associated with the vertical segments of smart homes, smart cities, industry and related IoT applications.

<Building><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`Building`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	M	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	M	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	M	Y

<Building><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
refBuildingType	Reference	Refers to the buildingType that this building is an instance of.	M	N
category	Array of Text	One or more categories relevant to the building with choices based on for example http://wiki.openstreetmap.org/wiki/Map_Features#Building	O	Y
containedInPlace	geo:json	The geo:json encoded polygon of the building plot in which this building sits.	O	Y
location	geo:json	The geo:json encoded polygon of this building.	M	N
address	PostalAddress	The building PostalAddress encoded as a Schema.org PostalAddress. https://schema.org/PostalAddress	M	Y
owner	Array of references to Person(s)	An array containing a JSON encoded sequence of characters referencing the unique Ids of the owner(s).	M	Y

	or Organization(s)	Related to a Schema.org person or organization. https://schema.org/Person https://schema.org/Organization		
occupier	Array of references to Person(s) or Organization(s)	An array containing a JSON encoded sequence of characters referencing the unique Ids of the occupiers(s). Related to a Schema.org person or organization. https://schema.org/Person https://schema.org/Organization	M	Y
refSubscriptionService	Array of Reference	An array containing a JSON encoded sequence of characters of the unique Ids of the subscription service(s) related to this building.	O	Y
floorsAboveGround	Number	The number of floors above ground level in this building.	O	Y
floorsBelowGround	Number	The number of floors below ground level in this building.	O	Y
description	Text	An optional description of the entity.	O	Y
mapUrl	URL	A URL to a mapping service which shows the location of the building.	O	Y
notes	Array of Text	Free format notes relating to the building e.g. published occupants, opening hours etc.	O	Y

2.3.11.1 Building JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/4994b9f4f6907a9a96bdb499899cc27f

```
{
  "id": "f95c06e3-776e-4a57-9b00-a85e3da145c1",
  "type": "Building",
  "dateCreated": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "dateModified": {
```

```
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "source": {
    "value": "http://www.example.com",
    "type": "URL"
  },
  "dataProvider": {
    "value": "OperatorA",
    "type": "Text"
  },
  "refBuildingType": {
    "value": "8b1f2bf0-5093-4182-ad4b-224182bb3b9f",
    "type": "Reference"
  },
  "category": [
    "House"
  ],
  "containedInPlace": {
    "value": {
      "type": "Polygon",
      "coordinates": [
        [100, 0],
        [101, 0],
        [101, 1],
        [100, 1],
        [100, 0]
      ]
    },
    "type": "geo:json"
  },
  "location": {
    "value": {
      "type": "Polygon",
      "coordinates": [
        [100, 0],
        [101, 0],
        [101, 1],
        [100, 1],
        [100, 0]
```

```
      ]
    },
    "type": "geo:json"
  },
  "address": {
    "type": "PostalAddress",
    "value": {
      "addressLocality": "London",
      "postalCode": "EC4N 8AF",
      "streetAddress": "25 Walbrook"
    }
  },
  "owner": [
    "cdfd9cb8-ae2b-47cb-a43a-b9767ffd5c84",
    "1be9cd61-ef59-421f-a326-4b6c84411ad4"
  ],
  "occupier": [
    "9830f692-7677-11e6-838b-4f9fb3dc5a4f"
  ],
  "refSubscriptionService": [
    "b4fb8bff-1a8f-455f-8cc0-ca43c069f865onService1",
    "55c24793-3437-4157-9bda-667c9e1531fc"
  ],
  "floorsAboveGround": {
    "value": 7,
    "type": "Number"
  },
  "floorsBelowGround": {
    "value": 0,
    "type": "Number"
  },
  "description": {
    "value": "Office block",
    "type": "Text"
  },
  "mapUrl": {
    "value": "http://www.example.com",
    "type": "URL"
  },
  "notes": {
```

```
    "value": "Intelligent entry barrier system, intelligent air
conditioning units",
    "type": "Text"
  }
}
```

2.3.12 BuildingOperation

This entity contains a harmonised description of a generic operation (related to smart buildings) applied to the referenced building. The building operation contains dynamic data reported by, or associated with a building or operations applicable to the building. This entity is associated with the vertical segments of smart homes, smart cities, industry and related IoT applications.

<BuildingOperation><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`BuildingOperation`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	M	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	M	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	M	Y

<BuildingOperation><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
refBuilding	Reference	Refers to the unique entity Id of the building to which this building record relates.	M	N
operationType	Text	Defines the type of operation conducted/ requested. This will be one of a defined list of operation types specific to the building.	O	Y
description	Text	A description of the operation.	O	Y
result	Text	A description of the results of the operation. One of (“ok”, “aborted”).	O	Y
startDate	DateTime	The planned start date for the operation.	M	Y
endDate	DateTime	The planned end date for the operation	M	Y

status	Text	A choice from an enumerated list describing the status. One of: **`planned, ongoing, finished, scheduled, cancelled`**	O	Y
operator	Person	The operator performing this action encoded as a Schema.org person. https://schema.org/Person	O	Y
dateStarted	DateTime	Timestamp when the operation actually started to be performed.	O	Y
dateFinished	DateTime	Timestamp when the operation actually finished.	O	Y
operationSequence	Text	The sequence of operations executed/ requested for the building in a representation format relevant to the building.	O	Y
refRelatedBuilding Operation	Array of Reference	An array containing a JSON encoded sequence of characters referencing the unique ids of any related building operations.	O	Y
refRelatedOperatio n	Array of Reference	An array containing a JSON encoded sequence of characters referencing the unique ids of any related operations (device, machine or other).	O	Y

2.3.12.1 BuildingOperation JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/bf5d982f79ab40934d6d38767b5f8f82


```
{
  "id": "57b912ab-eb47-4cd5-bc9d-73abece1f1b3",
  "type": "BuildingOperation",
  "dateCreated": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "dateModified": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "source": {
```

```
    "value": "http://www.example.com",
    "type": "URL"
  },
  "dataProvider": {
    "value": "OperatorA",
    "type": "Text"
  },
  "refBuilding": {
    "value": "f59e2074-0032-4ccd-b0dd-f06370ffb6af",
    "type": "Reference"
  },
  "operationType": {
    "value": "Air Conditioning Switch To Low Power",
    "type": "Text"
  },
  "description": {
    "value": "Air conditioning levels reduced due to out of hours",
    "type": "Text"
  },
  "result": {
    "value": "Operation successful",
    "type": "Text"
  },
  "startDate": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "endDate": {
    "value": "2016-08-20T10:18:16Z",
    "type": "DateTime"
  },
  "status": {
    "value": "Air conditioning fan & target temperature adjusted",
    "type": "Text"
  },
  "dateStarted": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "dateFinished": {
```

```
    "value": "2016-08-20T10:18:16Z",
    "type": "DateTime"
  },
  "operationSequence": {
    "value": "Fan levels reduced to minimum. Target temperature set
to 24 degrees Celsius. ",
    "type": "Text"
  },
  "refRelatedBuildingOperation": [
    "b4fb8bff-1a8f-455f-8cc0-ca43c069f865onService1",
    "55c24793-3437-4157-9bda-667c9e1531fc"
  ],
  "refRelatedDeviceOperation": [
    "36744245-6716-4a28-84c7-0e3d7520f143",
    "33b2b713-9223-40a5-87a0-3f80a1264a6c"
  ]
}
```

2.3.13 BuildingType

This entity contains a harmonised description of a generic building type. This entity is associated with the vertical segments of smart home, smart cities, industry and related IoT applications. The building type includes a hierarchical structure that allows building types to be grouped in a flexible way.

<BuildingType><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`BuildingType`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	M	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	M	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	M	Y

<BuildingType><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
name	Text	The name of this BuildingType.	M	N
description	Text	A description of this type.	O	Y
root	Boolean	A logical indicator that this is the root of a BuildingType hierarchy. TRUE indicates it is the root, FALSE indicates that it is not the root.	O	Y
refParentType	Array of Reference	An array containing a JSON encoded sequence of characters referencing the unique Ids of the building type groupings this BuildingType is a member of.	O	Y

2.3.13.1 BuildingType JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/e7553da5f75bc32e9f02024e7cdca0b1

```
{
```

```
  "id": "57b912ab-eb47-4cd5-bc9d-73abece1f1b3",
  "type": "BuildingType",
  "dateCreated": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "dateModified": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "source": {
    "value": "http://www.example.com",
    "type": "URL"
  },
  "dataProvider": {
    "value": "OperatorA",
    "type": "Text"
  },
  "name": {
    "value": "House",
    "type": "Text"
  },
  "description": {
    "value": "Standard building type definition for a domestic
house",
    "type": "Text"
  },
  "root": {
    "value": "FALSE",
    "type": "Boolean"
  },
  "refParentType": [
    "4146335f-839f-4ff9-a575-6b4e6232b734",
    "c44fc765-51a7-4f71-bf1e-22e874c35180"
  ]
}
```

2.3.14 Device

This entity contains a harmonised description of a generic device. This entity provides an essentially static description of a generic device and is therefore applicable to all IoT segments and related IoT applications.

<Device><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`Device`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	M	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	M	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	M	Y

<Device><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
refDeviceModel	Reference	Unique id of this device model selected from DeviceModel.	M	N
serialNumber	Text	The serial number assigned by the manufacturer.	M	N
supplierName	Text	The details of the supplier of this device.	O	Y
manufacturerCountry	Text	The country where this device was manufactured.	O	Y
factory	Text	The factory manufacturing this device.	O	Y
dateManufactured	DateTime	The ISO8601 sequence of characters at which the device was manufactured in UTC.	M	N
description	Text	An optional description of this device.	O	Y
owner	Array of Reference	An array containing a JSON encoded sequence of characters referencing the unique Ids of the owner(s).	O	Y

		Related to a Schema.org person or organization. https://schema.org/Person https://schema.org/Organization		
dateInstalled	DateTime	The ISO8601 sequence of characters at which the device was installed in UTC.	M	N
dateFirstUsed	DateTime	The ISO8601 sequence of characters at which the device was first used in UTC.	M	N
hardwareVersion	Text	The hardware version of this device.	M	N
firmwareVersion	Text	The firmware version of this device.	M	N
softwareVersion	Text	The software version of this device.	M	N
osVersion	Text	The operating system version of this device.	M	N
supportedProtocol	Array of Text	An array element per supported communication protocol.	M	N
location	geo:json	The geo:json encoded location, of this device.	O	Y
online	Boolean	The communication status of this device. A logical representation of Offline or Online.	M	N
status	Text	The JSON format device status description. Manufacturer or device. specific status codes generated by the device.	O	Y
dateLastCalibration	DateTime	The date this device was last calibrated.	O	Y
batteryLevel	ExtQuantitativeValue (Number)	Battery level. It must be equal to: 1.0 When the battery charge is full. 0.0 When the battery charge empty. Null when it cannot be determined. encoded as a ExtQuantitativeValue.	O	Y
value	ExtQuantitativeValue (Number)	The observed or reported value, for control applications the reported device setting value encoded as a ExtQuantitativeValue.	O	Y

2.3.14.1 Device JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/8bec6a39f34601fffc430b7b0f306df8


```
{
  "id": "ba2d4fd9-f57f-4610-a589-2d52670d14f3",
  "type": "Device",
  "dateCreated": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "dateModified": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "source": {
    "value": "http://www.example.com",
    "type": "URL"
  },
  "dataProvider": {
    "value": "OperatorA",
    "type": "Text"
  },
  "refDeviceModel": {
    "value": "d1be2e61-d9e7-43cd-9c68-51e0861b3a49",
    "type": "Reference"
  },
  "serialNumber": {
    "value": "123456789",
    "type": "Text"
  },
  "supplierName": {
    "value": "ACME Direct, Inc.",
    "type": "Text"
  },
  "manufacturerCountry": {
    "value": "UK",
    "type": "Text"
  },
  "factory": {
```

```
    "value": "unknown",
    "type": "Text"
  },
  "dateManufactured": {
    "value": "2016-08-21T10:18:16Z",
    "type": "DateTime"
  },
  "description": {
    "value": "Thermocouple",
    "type": "Text"
  },
  "owner": [
    "43c46ff2-b0f7-4e4f-838a-adee1c9cae88",
    "ebf421c9-363b-4ed4-97a0-93a6e39786ff"
  ],
  "dateInstalled": {
    "value": "2016-08-22T10:18:16Z",
    "type": "DateTime"
  },
  "dateFirstUsed": {
    "value": "2016-08-22T10:18:16Z",
    "type": "DateTime"
  },
  "hardwareVersion": {
    "value": "1.2",
    "type": "Text"
  },
  "firmwareVersion": {
    "value": "2.8.56",
    "type": "Text"
  },
  "softwareVersion": {
    "value": "2.5.11",
    "type": "Text"
  },
  "osVersion": {
    "value": "8.1",
    "type": "Text"
  },
  "supportedProtocols": [
```

```
    "HTTP",
    "HTTPS",
    "FTP"
  ],
  "location": {
    "value": {
      "type": "Point",
      "coordinates": [
        -104.99404,
        39.75621
      ]
    },
    "type": "geo:json"
  },
  "online": {
    "value": "TRUE",
    "type": "Boolean"
  },
  "status": {
    "value": "SC1001",
    "type": "Text"
  },
  "dateLastCalibration": {
    "value": "2016-08-22T10:18:16Z",
    "type": "DateTime"
  },
  "batteryLevel": {
    "value": {
      "value": 0.7
    },
    "type": "ExtQuantitativeValue"
  },
  "value": {
    "value": {
      "value": 1
    },
    "type": "ExtQuantitativeValue"
  }
}
```

2.3.15 DeviceModel

This entity contains a harmonised description of a generic device model and is therefore applicable to all IoT segments and related IoT applications. The Device Model includes an optional hierarchical structure that allows device types to be grouped in a flexible way.

<DeviceModel><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`DeviceModel`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	M	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	M	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	M	Y

<DeviceModel><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
name	Text	The name of this DeviceModel.	M	N
doc	URL	Reference to Product Data Sheet or other manufacturer's documentation about this device model including where relevant, details of the accuracy, trueness, precision and units of measure.	O	Y
category	Array of Text	A choice from an enumerated list defining the category of this device including: **`sensor, actuator, meter, appliance, heater, chiller, lighting, boiler, vessel, airHandlingUnit, consumer, other.`**	O	Y
description	Text	A description of this DeviceModel .	O	Y

manufacturerName	Text	The name of manufacturer of this DeviceModel.	O	Y
brandName	Text	A description of the brand name of this DeviceModel.	O	Y
root	Boolean	A logical indicator that this DeviceModel is the root of a DeviceModel hierarchy. TRUE indicates it is the root, FALSE indicates that it is not the root.	O	Y
refParentDeviceModel	Array of Reference	An array containing a JSON encoded sequence of characters of the unique Ids of the device model groupings this device model is a member of.	O	Y

2.3.15.1 DeviceModel JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/6ca009c7e08f6c54377ba758adbe7908


```
{
  "id": "e01f13d1-fea4-4cc4-92c9-0d9fadb2c509",
  "type": "DeviceModel",
  "dateCreated": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "dateModified": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "source": {
    "value": "http://www.example.com",
    "type": "URL"
  },
  "dataProvider": {
    "value": "OperatorA",
    "type": "Text"
  },
  "name": {
    "value": "Sensor Model 501",
    "type": "Text"
  },
  "doc": {
```

```
    "value": "http://www.example.com",
    "type": "URL"
  },
  "category": [
    "sensor"
  ],
  "description": {
    "value": "Monomatics All Weather Temperature Sensor",
    "type": "Text"
  },
  "manufacturerName": {
    "value": "ACME Manufacturing, Inc.",
    "type": "Text"
  },
  "brandName": {
    "value": "SuperWidgets",
    "type": "Text"
  },
  "root": {
    "value": "FALSE",
    "type": "Boolean"
  },
  "refParentDeviceModel": [
    "4146335f-839f-4ff9-a575-6b4e6232b734",
    "c44fc765-51a7-4f71-bf1e-22e874c35180"
  ]
}
```

2.3.16 DeviceOperation

This entity contains a harmonised description of a generic device operation entity. The device operation entity contains dynamic data reported by a device and is therefore applicable to all IoT segments and related IoT applications.

<DeviceOperation><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`DeviceOperation`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	M	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	M	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	M	Y

<DeviceOperation><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
refDevice	Reference	The unique entity Id of the device to which this device operation relates.	M	N
operationType	Array of Text	Choice form an enumerated list including: **`event, maintenance, fault, installation, upgrade,other.`**	O	Y
description	Text	A description of the operation.	O	Y
result	Text	A description of the results of the operation. One of (“**`ok`**”, “**`aborted`**”).	O	Y
startDate	DateTime	The planned start date for the operation.	M	Y
endDate	DateTime	The planned end date for the operation.	M	Y
status	Text	A choice from an enumerated list describing the status. One of: **`planned, ongoing, finished, scheduled, cancelled.`**	O	Y

operator	Person	The operator performing this action encoded as a Schema.org person. https://schema.org/Person	O	Y
dateStarted	DateTime	Timestamp when the operation actually started to be performed.	O	Y
dateFinished	DateTime	Timestamp when the operation actually finished.	O	Y
dateReported	DateTime	The timestamp when the device event or fault was reported.	O	Y
dateAddressed	DateTime	The timestamp when the event or fault was addressed or cleared.	O	Y

2.3.16.1 DeviceOperation JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/581d2de918e01fb05efd35f27686f361


```
{
  "id": "27577638-bd8a-4732-b418-fc8b949a0b0f",
  "type": "DeviceOperation",
  "dateCreated": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "dateModified": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "source": {
    "value": "http://www.example.com",
    "type": "URL"
  },
  "dataProvider": {
    "value": "OperatorA",
    "type": "Text"
  },
  "refDevice": {
    "value": "2033a7c7-d31b-48e7-91c2-014dc426c29e",
    "type": "Reference"
  },
```

```
  "operationType": [
    "fault"
  ],
  "description": {
    "value": "Backup battery needs replacement",
    "type": "Text"
  },
  "result": {
    "value": "ok",
    "type": "Text"
  },
  "startDate": {
    "value": "2016-08-20T10:18:16Z",
    "type": "DateTime"
  },
  "endDate": {
    "value": "2016-08-18T14:18:16Z",
    "type": "DateTime"
  },
  "status": {
    "value": "ongoing",
    "type": "Text"
  },
  "operator": {
    "value": {
      "givenName": "John Dee"
    },
    "type": "Person"
  },
  "dateStarted": {
    "value": "2016-08-20T10:18:16Z",
    "type": "DateTime"
  },
  "dateFinished": {
    "value": "2016-08-18T10:18:16Z",
    "type": "DateTime"
  },
  "dateReported": {
    "value": "2016-08-18T10:18:16Z",
    "type": "DateTime"
```

```
  },
  "dateAddressed": {
    "value": "2016-08-18T10:18:16Z",
    "type": "DateTime"
  }
}
```

2.3.17 EnvironmentObserved

This entity contains a harmonised description of the environmental conditions observed at a particular location and time. This entity is primarily associated with the vertical segment of the environment and agriculture but may also be used in smart home, smart cities, industry and related IoT applications.

<EnvironmentObserved><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`EnvironmentObserved`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	M	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	M	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	M	Y

<EnvironmentObserved><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
location	geo:json	The geo:json encoded map location, of this observation.	M	N
refWeatherObserved	Array of Reference	An array containing a JSON encoded sequence of characters that reference the unique ids of the related weather entities.	O	Y
refAirQualityObserved	Array of Reference	An array containing a JSON encoded sequence of characters that reference the unique ids of the related AirQualityObserved entities.	O	Y
refWaterQualityObserved	Array of Reference	An array containing a JSON encoded sequence of characters that reference the unique ids of the related WaterQuality entities.	O	Y

measurand	Array of Text	An array containing a JSON encoded sequence of characters of the measurand observed.
		
		`measurand, observedValue, unitcode, description`
		
		Unitcode defined as in schema.org/QuantitativeValue
		
		The unit of measurement given using the UN/CEFACT Common Code (3 characters) – the unitcode.
		
		http://wiki.goodrelations-vocabulary.org/Documentation/UN/CEFACT_Common_Codes
		
		Possible examples of typical measurands, descriptions and unitcodes are presented below:
		
		`O2. The level of free, non-compound oxygen present. (M1)`
		`Hg. The level of compound mercury present. (M1)`
		`NH4. Concentration of ammonium. (M1)`
		`Cl-. Concentration of chlorides. (M1)`
		`NO3-. Concentration of nitrates. (M1)`
		`etc.`
			O	Y

2.3.17.1 EnvironmentObserved JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/c393d8082375c9f211ef797d5581c602

```
{
  "id": "33f02632-74f4-4c96-9ba1-e26945de9481",
  "type": "EnvironmentObserved",
  "dateCreated": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "dateModified": {
    "value": "2016-08-08T10:18:16Z",
```

```
    "type": "DateTime"
  },
  "source": {
    "value": "http://www.example.com",
    "type": "URL"
  },
  "dataProvider": {
    "value": "OperatorA",
    "type": "Text"
  },
  "location": {
    "value": {
      "type": "Point",
      "coordinates": [
        -104.99404,
        39.75621
      ]
    },
    "type": "geo:json"
  },
  "refWeatherObserved": [
    "fae29f4c-0691-4bab-bef8-ad1cd165cc28",
    "1c7a2711-ae38-4ea9-8f9f-627067067d53"
  ],
  "refAirQualityObserved": [
    "4b8b09c9-ce54-46de-8067-5591e02d8f29",
    "08a14933-b44d-4297-b2d2-2c3f3844012e"
  ],
  "refWaterQualityObserved": [
    "68a83e68-61e6-4e3c-975c-5b301c184ca6",
    "b01518e3-2b60-4bbd-9783-3af0d660349e"
  ],
  "measurand": [
     "CO, 500, M1, Carbon Monoxide"
  ]
}
```

2.3.18 Machine

This entity contains a harmonised description of an industrial machine for example for use in CAM (Computer Aided Manufacturing). This entity provides an essentially static description of a generic automation machine. This entity is primarily associated with the industry segment in the automated manufacturing industry, including CNC (Computer Numerical Control) machines, 3D printers and all kinds of industrial robots.

<Machine><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`Machine`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	M	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	M	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	M	Y

<Machine><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
refMachineModel	Reference	Refers to the machineModel that this machine is an instance of.	M	N
serialNumber	Text	The serial number assigned by the manufacturer.	M	N
assetIdentifier	Text	An asset identifier (e.g. asset tag number) assigned by the owner.	O	Y
manufacturerCountry	Text	The country where this machine instance was manufactured.	O	Y
dateManufactured	DateTime	The ISO8601 sequence of characters at which the machine was manufactured in UTC.	M	N
dateInstalled	DateTime	The ISO8601 sequence of characters at which the machine was installed in UTC.	M	N

dateFirstUsed	DateTime	The ISO8601 sequence of characters at which the machine was first used in UTC.	M	N
online	Boolean	Identifies the communication status of the machine, online if set to TRUE.	O	Y
installationNotes	Text or URL	Notes relating to this machine installation.	O	Y
location	geo:json	The geo:json encoded location, of this machine.	M	N
refBuilding	Reference	Refers to the building instance into which this machine is installed.	O	Y
owner	Array of Reference	An array containing a JSON encoded sequence of characters referencing the unique Ids of the owner(s). Related to a Schema.org person or organization. https://schema.org/Person https://schema.org/Organization	O	Y
refSubscriptionService	Array of Reference	An array containing a JSON encoded sequence of characters of the unique Ids of any subscription service(s) associated with this machine.	O	Y
description	Text	An optional description of this machine.	O	Y

2.3.18.1 Machine JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/aaa70bd157da04b6246d35525a7ffbcc

```
{
  "id": "9166c528-9c98-4579-a5d3-8068aea5d6c0",
  "type": "Machine",
  "dateCreated": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "dateModified": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
```

```
  "source": {
    "value": "http://www.example.com",
    "type": "URL"
  },
  "dataProvider": {
    "value": "OperatorA",
    "type": "Text"
  },
  "refMachineModel": {
    "value": "00b42701-43e1-482d-aa7a-e2956cfd69c3",
    "type": "Reference"
  },
  "serialNumber": {
    "value": "123456789",
    "type": "Text"
  },
  "assetIdentifier": {
    "value": "1234567",
    "type": "Text"
  },
  "manufacturerCountry": {
    "value": "UK",
    "type": "Text"
  },
  "dateManufactured": {
    "value": "2016-08-21T10:18:16Z",
    "type": "DateTime"
  },
  "dateInstalled": {
    "value": "2016-08-22T10:18:16Z",
    "type": "DateTime"
  },
  "dateFirstUsed": {
    "value": "2016-08-22T10:18:16Z",
    "type": "DateTime"
  },
  "online": {
    "value": "TRUE",
    "type": "Boolean"
  },
```

```
  "installationNotes": {
    "value": "http://www.example.com/installationNote1.txt",
    "type": "URL"
  },
  "location": {
    "value": {
      "type": "Point",
      "coordinates": [
        -104.99404,
        39.75621
      ]
    },
    "type": "geo:json"
  },
  "refBuilding": {
    "value": "8683b757-649c-49e0-ac89-ad392c9a0d0c",
    "type": "Reference"
  },
  "owner": [
    "247d402f-3e0b-4e7c-a2c0-335590c27f90",
    "a7995eb7-6bec-4176-b2e8-af545e2bb3b9"
  ],
  "refSubscriptionService": [
    "92158a14-f6c6-4d29-85d1-5d305cc87982",
    "3c6bac7b-9398-4529-8d89-766435b7490b"
  ],
  "description": {
    "value": "Industrial machine to create plastic bottles",
    "type": "Text"
  }
}
```

2.3.19 MachineModel

This entity contains a harmonised description of a generic machine model. This entity is primarily associated with the industry segment and related IoT applications. The machineModel includes a hierarchical structure that allows machine models to be grouped in a flexible way.

<MachineModel><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`MachineModel`**".	M	N
dateCreated	Date	Entity creation timestamp.	M	N
dateModified	Date	Timestamp of the last modification of the entity.	M	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	M	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	M	Y

<MachineModel><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
name	Text	The name given to this machine model.	M	N
description	Text	A description of this machine model.	O	Y
manufacturerName	Text	The name of manufacturer of this machine model.	O	Y
brandName	Text	A description of this machine model brand name.	O	Y
version	Text	The manufacturer defined version number for the machine model.	O	Y
category	Array of Text	An array of text based service categories which this machineModel supports. Examples include: **`robot, cnc, 2dPrinter, 3dPrinter, 3dScanner, lathe, injectionMolding, laserCutter, millingMachine, grindingMachine,`**	O	Y

		stampingMachine, oven, kiln, packaging, mixer, dryer, fan, saw.		
doc	URL	Reference to Product Data Sheet or other manufacturers documentation about this machine.	O	Y
root	Boolean	A logical indicator that this machineModel is the root of a machineModel hierarchy. TRUE indicates it is the root, FALSE indicates that it is not the root.	O	Y
refParentModel	Array of Reference	An array containing a JSON encoded sequence of characters referencing the ids of other machine models which this is related to.	O	Y
processDescription	Text	A description of the industrial process carried out by this machine.	O	Y
standardOperations	Array of Text	Lists the standard set of operations supported by this machineModel.	O	Y

2.3.19.1 MachineModel JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/10d7c9ffca1e4d1e498203f85dc0991d


```
{
  "id": "e01f13d1-fea4-4cc4-92c9-0d9fadb2c509",
  "type": "MachineModel",
  "dateCreated": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "dateModified": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "source": {
    "value": "http://www.example.com",
    "type": "URL"
  },
  "dataProvider": {
    "value": "OperatorA",
```

```
    "type": "Text"
  },
  "name": {
    "value": "CA1256b",
    "type": "Text"
  },
  "description": {
    "value": "Machine to screen print t-shirts",
    "type": "Text"
  },
  "manufacturerName": {
    "value": "ScreenOPrint, Inc.",
    "type": "Text"
  },
  "brandName": {
    "value": "QuickT",
    "type": "Text"
  },
  "version": {
    "value": "v1",
    "type": "Text"
  },
  "category": [
    "2dPrinter"
  ],
  "doc": {
    "value": "http://www.example.com",
    "type": "URL"
  },
  "root": {
    "value": "FALSE",
    "type": "Boolean"
  },
  "refParentModel": [
    "4146335f-839f-4ff9-a575-6b4e6232b734",
    "c44fc765-51a7-4f71-bf1e-22e874c35180"
  ],
  "processDescription": {
    "value": "Industrial printer used to mass print t-shirts",
    "type": "Text"
```

```
  },
  "standardOperations": [
    "print"
  ]
}
```

2.3.20 MachineOperation

This entity contains a harmonised description of a generic machine operation. This entity is primarily associated with the industry segment and related IoT applications. Each MachineOperation instance will be related to a specific Machine instance.

<MachineOperation><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`MachineOperation`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	M	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	M	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	M	Y

<MachineOperation><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
refMachine	Reference	Refers to the specific machine instance that this machineOperation record relates to.	M	N
operationType	Text	Defines the type of operation conducted/ requested. This will be one of a defined list of operation types specific to the machine/ machineModel.	M	N
description	Text	A description of the operation conducted or applied.	O	Y
result	Text	A description of the results of the operation. One of (“**`ok`**”, “**`aborted`**”).	O	Y
startDate	DateTime	The planned start date for the operation.	M	Y
endDate	DateTime	The planned end date for the operation.	M	Y
status	Text	A choice from an enumerated list describing the status. One of:	O	Y

		planned, ongoing, finished, scheduled, cancelled.		
operator	Person	The operator performing this action encoded as a Schema.org person. https://schema.org/Person	O	Y
dateStarted	DateTime	Timestamp when the operation actually started to be performed.	O	Y
dateFinished	DateTime	Timestamp when the operation actually finished.	O	Y
commandSequence	Text	The command sequence executed/ requested for the machine in a representation format relevant to the machine.	O	Y

2.3.20.1 MachineOperation JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/a2a2795c194831ac06c48222eb49e2ce


```
{
  "id": "27577638-bd8a-4732-b418-fc8b949a0b0f",
  "type": "MachineOperation",
  "dateCreated": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "dateModified": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "source": {
    "value": "http://www.example.com",
    "type": "URL"
  },
  "dataProvider": {
    "value": "OperatorA",
    "type": "Text"
  },
  "refMachine": {
    "value": "2033a7c7-d31b-48e7-91c2-014dc426c29e",
```

```
    "type": "Reference"
  },
  "operationType": {
    "value": "tShirtPrint",
    "type": "Text"
  },
  "description": {
    "value": "Printing of 1000 T-shirts",
    "type": "Text"
  },
  "result": {
    "value": "ok",
    "type": "Text"
  },
  "startDate": {
    "value": "2016-08-20T10:18:16Z",
    "type": "DateTime"
  },
  "endDate": {
    "value": "2016-08-18T14:18:16Z",
    "type": "DateTime"
  },
  "status": {
    "value": "finished",
    "type": "Text"
  },
  "operator": {
    "value": {
      "name": "Fred Quimby",
      "jobTitle": "Print Supervisor"
    },
    "type": "Person"
  },
  "dateStarted": {
    "value": "2016-08-20T10:18:16Z",
    "type": "DateTime"
  },
  "dateFinished": {
    "value": "2016-08-18T14:18:16Z",
    "type": "DateTime"
```

```
  },
  "commandSequence": {
    "value": "Select inks. Prepare print masks. Print shirts. Clean
print heads and rollers ",
    "type": "Text"
  }
}
```

2.3.21 PointOfInterest

This entity contains a harmonised geographic description of a Point of Interest. This entity is used in applications that use spatial data and is applicable to Automotive, Environment, Industry and Smart City vertical segments and related IoT applications.

<PointOfInterest><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`PointOfInterest`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	M	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	M	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	M	Y

<PointOfInterest><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
location	geo:json	The geo:json encoded map location (point or polygon), of this point of interest.	M	N
category	Array	A JSON encoded array of one or more sequence of characters describing categories associated with this point of interest. A choice from: **`church, school, town hall, distinctiveBuilding, postOffice, shop, postBox, telephoneBox, pub, car park, lay-bye, speedCamera, restaurant, tourist attraction, other.`**	M	Y
description	Text	An optional description of the entity.	O	Y
place	Place	The schema.org place definition for this Point Of Interest. See https://schema.org/Place	O	Y

2.3.21.1 PointOfInterest JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/d9f9c492f06a96e6c6b06938002a3505


```
{
  "id": "44e47705-90c3-4dbc-a0ae-7810306de5e9",
  "type": "PointOfInterest",
  "dateCreated": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "dateModified": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "source": {
    "value": "http://www.example.com",
    "type": "URL"
  },
  "dataProvider": {
    "value": "OperatorA",
    "type": "Text"
  },
  "location": {
    "value": {
      "type": "Point",
      "coordinates": [
        -104.99404,
        39.75621
      ]
    },
    "type": "geo:json"
  },
  "category": [
    "school"
  ],
  "description": {
    "value": "Learn all about mobile at the GSMA Academy",
    "type": "Text"
  },
```

```
  "place": {
    "type": "Place",
    "value": {
      "name": "GSMA Academy",
      "address": {
        "type": "PostalAddress",
        "addressLocality": "London",
        "postalCode": "EC4N 8AF",
        "streetAddress": "25 Walbrook"
      },
      "telephone": "0212345678"
    }
  }
}
```

2.3.22 Road

This entity contains a harmonised geographic and contextual description of a Road. Roads are made up of one or more RoadSegment entities. This entity is primarily associated with the Automotive and Smart City vertical segments and related IoT applications.

<Road><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**Road**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	M	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	M	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	M	Y

<Road><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
refRoadSegment	Array of Reference	A JSON encode sequence of characters referencing the unique ids of the group of roadSegments that define this road.	M	Y
roadClass	Text	The official classification of this road.	M	Y
name	Text	The official designation of this road.	M	Y
alternateName	Text	An alternative name for this road.	O	Y

2.3.22.1 Road JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/fce0066af2ef3aad51eb20a139501303

```
{
  "id": "19b6f4b7-a9b4-4114-8391-3133bf96aedc",
  "type": "Road",
  "dateCreated": {
```

```
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "dateModified": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "source": {
    "value": "http://www.example.com",
    "type": "URL"
  },
  "dataProvider": {
    "value": "OperatorA",
    "type": "Text"
  },
  "refRoadSegment": [
    "2a982120-4d98-425b-a8db-1de5563db6a8",
    "43e255c7-262e-4d6d-95a1-69a53e37dcc0"
  ],
  "roadClass": {
    "value": "Dual Carriageway",
    "type": "Text"
  },
  "name": {
    "value": "M1",
    "type": "Text"
  },
  "alternateName": {
    "value": "M1 Motorway",
    "type": "Text"
  }
}
```

2.3.23 RoadSegment

This entity contains a harmonised geographic and contextual description of a RoadSegment. A collection of RoadSegments are used to describe a Road. This entity is primarily associated with the Automotive and Smart City vertical segments and related IoT applications.

<RoadSegment><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`RoadSegment`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	M	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	M	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	M	Y

<RoadSegment><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
startPoint	geo:json	The start point of this RoadSegment.	M	N
endPoint	geo:json	The end point of this RoadSegment.	M	N
roadClass	Text	The official classification of the road that this roadSegment is a part of.	M	Y
name	Text	The official designation of the road that this roadSegment is a part of.	M	Y
location	geo:json	A geo:json line sequence containing all the points that make up this RoadSegment.	M	Y
refPointofInterest	Array of Reference	An array containing a JSON encoded sequence of characters referencing the Ids of the points of interest along this road segment.	O	Y

2.3.23.1 RoadSegment JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/feebdab56255971124c8236ec8c44528


```
{
  "id": "27109fe0-0c60-4302-a9eb-e7065eca876e",
  "type": "RoadSegment",
  "dateCreated": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "dateModified": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "source": {
    "value": "http://www.example.com",
    "type": "URL"
  },
  "dataProvider": {
    "value": "OperatorA",
    "type": "Text"
  },
  "startPoint": {
    "value": {
      "type": "Point",
      "coordinates": [
        -104.99404,
        39.75621
      ]
    },
    "type": "geo:json"
  },
  "endPoint": {
    "value": {
      "type": "Point",
      "coordinates": [
        -109.99404,
        32.75621
      ]
    },
    "type": "geo:json"
  },
```

```
  "roadClass": {
    "value": "Single Carriageway",
    "type": "Text"
  },
  "name": {
    "value": "A123",
    "type": "Text"
  },
  "location": {
    "value": {
      "type": "LineString",
      "coordinates": [
        [-102.98, 32.75],
        [-103.99, 30.75],
        [-103.99, 31.75]
      ]
    },
    "type": "geo:json"
  },
  "refPointofInterest": [
    "4d798319-22b1-4714-b847-b81dbba3357b",
    "1909a43d-e5a1-46cb-bbd0-7cc16bc4fa33"
  ]
}
```

2.3.24 Subscriber

This entity contains a harmonised description of a subscriber to a service. This entity is primarily associated with the Smart Home vertical segment and related IoT applications.

<Subscriber><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`Subscriber`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	M	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	M	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	M	Y

<Subscriber><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
subscriptionId	Reference	A reference to the unique id of the subscription service.	M	N
startDate	DateTime	The start date time for this subscription as an ISO8601 sequence of characters in UTC.	O	Y
endDate	DateTime	The end date time for this subscription as an ISO8601 sequence of characters in UTC.	O	Y
duration	Number	The duration of the subscription in calendar months.	O	Y
category	Array of Text	The category of subscription. A selection from an enumerated list including: **`prepay, postpay, utility, broadband, electric, gas, heat, water, landline, mobile, tv, security, financial, energy management, other.`**	O	Y

averageMonthly Usage	Number	Average monthly usage of the subscription service.	O	Y
subscribed	Array of Reference	An array containing a JSON encoded sequence of characters referencing the unique ids of those persons or organisations that have subscribed to this service. Related to a Schema.org person or organization. https://schema.org/Person https://schema.org/Organization	O	Y

2.3.24.1 Subscriber JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/a2be9b6079309c8ea2d7a6830c31c306


```
{
  "id": "c1716dea-6a4d-4171-a733-916123942f09",
  "type": "Subscriber",
  "dateCreated": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "dateModified": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "source": {
    "value": "http://www.example.com",
    "type": "URL"
  },
  "dataProvider": {
    "value": "OperatorA",
    "type": "Text"
  },
  "subscriptionId": {
    "value": "65b1ccb0-ee32-41c1-9746-7ba83fb0f0f1",
    "type": "Reference"
  },
```

```
  "startDate": {
    "value": "2016-08-22T10:18:16Z",
    "type": "DateTime"
  },
  "endDate": {
    "value": "2016-08-28T10:18:16Z",
    "type": "DateTime"
  },
  "duration": {
    "value": 12,
    "type": "Number"
  },
  "category": [
    "utility"
  ],
  "averageMonthlyUsage": {
    "value": 28,
    "type": "Number"
  },
  "subscribed": [
    "31dd0e29-45b6-476f-9756-a70f8141dcf3"
  ]
}
```

2.3.25 SubscriptionService

This entity contains a harmonised description of a subscription service. This entity is primarily associated with the Smart Home vertical segment and related IoT applications.

<SubscriptionService><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`SubscriptionService`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	M	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	M	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	M	Y

<SubscriptionService><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
description	Text	The description of this service.	M	N
offer	Offer	Encoded as Schema.org offer. https://schema.org/Offer	M	Y

2.3.25.1 SubscriptionService JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/1631ff51b1aa49a0422741f9b5631ecf

```
{
  "id": "a1e76f95-c627-4ec4-86dc-483431d25352",
  "type": "SubscriptionService",
  "dateCreated": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
```

```
  "dateModified": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "source": {
    "value": "http://www.example.com",
    "type": "URL"
  },
  "dataProvider": {
    "value": "OperatorA",
    "type": "Text"
  },
  "description": {
    "value": "Broadband supply service",
    "type": "Text"
  },
  "offer": {
    "type": "Offer",
    "value" : {
      "priceCurrency": "USD",
      "price": 1000,
      "description": "100 mbps fibre broadband service"
    }
  }
}
```

2.3.26 Vehicle

This entity contains a harmonised description of a Vehicle. This entity is primarily associated with the Automotive vertical segment but might also be relevant to Industry, Smart City and Agriculture related IoT applications. Where practicable https://schema.org/Vehicle naming conventions have been adopted.

<Vehicle><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`Vehicle`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	M	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	M	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	M	Y

<Vehicle><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
refVehicleType	Array of Reference	A JSON encode sequence of characters referencing the Id of the vehicleType entity which describes this vehicle in more detail.	M	N
fuelType	Text	A choice from an enumerated list describing the power source. One of: **`gasoline, petrol(unleaded), petrol(leaded), petrol, diesel, electric, hydrogen, lpg autogas, cng, biodiesel, ethanol, hybrid electric/petrol, hybrid electric/diesel, other`**	M	N
displacement	Number	A number indicating the cylinder capacity of the engine in litres	O	Y
fuelEconomy	Number	A number indicating the fuel economy index.	O	Y

vehicleModelDate	DateTime	The ISO8601 sequence of characters indicating the year of release.	O	Y
dateDiscontinued	DateTime	The ISO8601 sequence of characters indicating the year which the vehicle was discontinued.	O	Y
vechileIdentification Number	Text	The VIN (vehicle identification number) of the vehicle.	O	Y
mileageFromOdometer	ExtQuantitativeValue (Number)	The total distance the car has travelled according to the on-board odometer in kilometres or miles, references Schema.org Vehicle/ mileageFromOdometer.	O	Y

2.3.26.1 Vehicle JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/f28833b6c5c51c3e79fa6f7dfa1a7864


```
{
  "id": "1fa179a6-b507-4857-ad72-eb5513ef05c6",
  "type": "Vehicle",
  "dateCreated": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "dateModified": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "source": {
    "value": "http://www.example.com",
    "type": "URL"
  },
  "dataProvider": {
    "value": "OperatorA",
    "type": "Text"
  },
  "refVehicleType": [
    "23821045-33d4-46ec-b777-98f461bf4856",
    "2ff57791-ebfb-4086-ab61-60b5beed605d"
  ],
```

```
  "fuelType": {
    "value": "Diesel",
    "type": "Text"
  },
  "displacement": {
    "value": 3,
    "type": "Number"
  },
  "fuelEconomy": {
    "value": 22,
    "type": "Number"
  },
  "vehicleModelDate": {
    "value": "2016-08-18T10:18:16Z",
    "type": "DateTime"
  },
  "dateDiscontinued": {
    "value": "2016-08-23T10:18:16Z",
    "type": "DateTime"
  },
  "vehicleIdentificationNumber": {
    "value": "2T2GK31U08C041124",
    "type": "Text"
  },
  "mileageFromOdometer": {
    "value": {
      "value": 33015,
      "unitCode": "NMI"
    },
    "type": "ExtQuantitativeValue"
  }
}
```

2.3.27 VehicleFault

This entity contains a harmonised description of a Vehicle Fault. This entity is primarily associated with the Automotive vertical segment but might also be relevant to Industry, Smart City and Agriculture related IoT applications.

<VehicleFault><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`VehicleFault`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	M	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	M	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	M	Y

<VehicleFault><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
refVehicle	Array of Reference	A JSON encode sequence of characters referencing the Id of the vehicle in which this fault occurred.	M	N
dateDetected	DateTime	An ISO8601 sequence of characters indicating the date and time the fault was detected.	M	N
eventType	Text	The event type descriptor, a choice from an enumerated list including: **`collision, emergency, harshAccel, harshDecel, auxBatteryWarn, milWarn`**.	M	N
location	geo:json	The geo location where the fault was detected.	M	Y
processingType	Text	Indicates how the fault was dealt with, e.g. `systemHandled`, or not present if the issue has not been resolved.	O	Y

dateProcessed	DateTime	The ISO8601 sequence of characters indicating the data and time at which the issue was solved, or not present if the issue has not been resolved.	O	Y
dtCode	Text	DTC or Diagnostic Trouble Codes are codes generated by the vehicle's computer diagnostic system. These may be manufacturer, equipment or vehicle specific.	O	Y
faultLog	Text	Free text that records information about the initial fault incident, ongoing updates and fault resolution.	O	Y

2.3.27.1 VehicleFault JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/2e40b95654493bc44cabe360e9c3f82d

```
{
  "id": "4939200a-5ef5-4266-8c91-1f82ad3b543b",
  "type": "VehicleFault",
  "dateCreated": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "dateModified": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "source": {
    "value": "http://www.example.com",
    "type": "URL"
  },
  "dataProvider": {
    "value": "OperatorA",
    "type": "Text"
  },
  "refVehicle": [
    "e64a2ecb-a8ae-4f51-ab66-2e9729c02d22"
  ],
  "dateDetected": {
    "value": "2016-08-20T10:18:16Z",
```

```
    "type": "DateTime"
  },
  "eventType": {
    "value": "emergency",
    "type": "Text"
  },
  "location": {
    "value": {
      "type": "Point",
      "coordinates": [
        -104.99404,
        39.75621
      ]
    },
    "type": "geo:json"
  },
  "processingType": {
    "value": "systemHandled",
    "type": "Text"
  },
  "dateProcessed": {
    "value": "2016-08-21T10:18:16Z",
    "type": "DateTime"
  },
  "dtCode": {
    "value": "EMERG-1234-a",
    "type": "Text"
  },
  "faultLog": {
    "value": "Emergency stop. Fault with engine",
    "type": "Text"
  }
}
```

2.3.28 VehicleType

This entity contains a harmonised description of a vehicleType it forms part of the description of a Vehicle. This entity is primarily associated with the Automotive vertical segment but might also be relevant to Industry, Smart City and Agriculture related IoT applications. Where practicable https://schema.org/Vehicle naming conventions have been adopted.

<VehicleType><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`VehicleType`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	M	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	M	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	M	Y

<VehicleType><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
model	Text	The vehicle model identifier.	M	N
category	Text	The vehicle class identifier.	M	N
manufacturer	Text	The manufacturer's identifier.	M	N

2.3.28.1 VehicleType JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/7be3126e94779c6467fb56e1b3b0935d

```
{
  "id": "33253089-9cea-4227-889e-61950965f6f9",
  "type": "VehicleType",
  "dateCreated": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
```

```
  "dateModified": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "source": {
    "value": "http://www.example.com",
    "type": "URL"
  },
  "dataProvider": {
    "value": "OperatorA",
    "type": "Text"
  },
  "model": {
    "value": "M Class",
    "type": "Text"
  },
  "category": {
    "value": "SUV",
    "type": "Text"
  },
  "manufacturer": {
    "value": "Mercedes Benz",
    "type": "Text"
  }
}
```

2.3.29 WaterQualityObserved

This entity contains a harmonised description of the water quality at a particular location and time. This entity is primarily associated with the vertical segments of agricultural and environment and related IoT applications.

<WaterQualityObserved><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`WaterQualityObserved`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	M	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	M	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	M	Y

<WaterQualityObserved><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
refDevice	Array of Reference	A reference to the unique entity Ids of the devices that originated this observation data.	M	N
location	geo:json	The geo:json encoded map location, that is related to this observation.	M	N
dateObserved	DateTime	The date and time of this observation in ISO8601 UTCformat.	M	N
measurand	Array of Text	An array containing a JSON encoded sequence of characters of the measurand observed. **`measurand, valueObserved, unitcode, description.`** Unitcode defined as in schema.org/QuantitativeValue	O	Y

		The unit of measurement given using the UN/CEFACT Common Code (3 characters) – the unitcode. http://wiki.goodrelations-vocabulary.org/Documentation/UN/CEFACT_Common_Codes see example below: **"O2, 50,M1,The level of free non-compound oxygen present"** Possible examples of typical measurands, descriptions and unitcodes are presented below: **O2. The level of free non-compound oxygen present. (*M1*)** **CO. The level of free non-compound carbon monoxide present. (*M1*)** **CO2. The level of free non-compound carbon dioxide present. (*M1*)** **Hg. The level of compound mercury present. (*M1*)** **Chla. Concentration of chlorophyll A. (*H29*)** **PE. Concentration of pigment *phycoerythrin* which can be measured to estimate cyanobacteria concentrations specifically.(H29)** **PC. Concentration of pigment *phycocyanin* which can be measured to estimate cyanobacteria concentrations specifically. (*H29*)** **NH4. Concentration of ammonium. (*M1*)** **NH3. Concentration of ammonia. (*M1*)** **Cl-. Concentration of chlorides. (*M1*)** **NO3-. Concentration of nitrates. (*M1*)** etc.		
depth	ExtQuantitativeValue (Number)	Depth where the observation was taken. (*m*) encoded as a ExtQuantitativeValue.	O	Y

pressure	ExtQuantitativeValue (Number)	Hydrostatic pressure where the observation was taken. (Pa) encoded as a ExtQuantitativeValue.	O	Y
conductivity	ExtQuantitativeValue (Number)	Electrical conductivity. (*S/m*) encoded as a ExtQuantitativeValue.	O	Y
conductance	ExtQuantitativeValue (Number)	Specific conductivity / 25 ºC /. (*S/m*) encoded as a ExtQuantitativeValue.	O	Y
temperature	ExtQuantitativeValue (Number)	The temperature expressed in degrees Celsius encoded as a ExtQuantitativeValue.	O	Y
tss	ExtQuantitativeValue (Number)r	Total suspended solids. (*M1*) encoded as a ExtQuantitativeValue	O	Y
tds	ExtQuantitativeValue (Number)	Total dissolved solids. (*M1*) encoded as a ExtQuantitativeValue.	O	Y
turbidity	ExtQuantitativeValue (Number)	Amount of light scattered by particles in the water column. (*FTU*). encoded as a ExtQuantitativeValue.	O	Y
salinity	ExtQuantitativeValue (Number)	Derived from the conductivity measurement. (*parts per thousand, ppt*) encoded as a ExtQuantitativeValue.	O	Y
pH	ExtQuantitativeValue (Number)	pH measurement (typically a number between *0 and 14*) encoded as a ExtQuantitativeValue.	O	Y
orp	ExtQuantitativeValue (Number)	Oxidation-Reduction potential (*mV*) encoded as a ExtQuantitativeValue.	O	Y
cdom	ExtQuantitativeValue (Number)	Color dissolved organic matter (*RFU*) encoded as a ExtQuantitativeValue.	O	Y

2.3.29.1 WaterQualityObserved JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/5252d6628d7a06472c7e7fc366b7ee23

```
{
  "id": "72a30ca8-888e-49a2-8d8d-a5bebc19e98b",
  "type": "WaterQualityObserved",
```

```
  "dateCreated": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "dateModified": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "source": {
    "value": "http://www.example.com",
    "type": "URL"
  },
  "dataProvider": {
    "value": "OperatorA",
    "type": "Text"
  },
  "refDevice": [
    "2033a7c7-d31b-48e7-91c2-014dc426c29e"
  ],
  "location": {
    "value": {
      "type": "Point",
      "coordinates": [
        -104.99404,
        39.75621
      ]
    },
    "type": "geo:json"
  },
  "dateObserved": {
    "value": "2016-08-16T10:18:16Z",
    "type": "DateTime"
  },
  "measurand": [
    "O2, 50, M1, Oxygen concentration"
  ],
  "depth": {
    "value": {
      "value": 4,
      "unitCode": "MTR"
```

```
    },
    "type": "ExtQuantitativeValue"
  },
  "pressure": {
    "value": {
      "value": 10202,
      "unitCode": "PAL"
    },
    "type": "ExtQuantitativeValue"
  },
  "conductivity": {
    "value": {
      "value": 10,
      "unitCode": "D10"
    },
    "type": "ExtQuantitativeValue"
  },
  "conductance": {
    "value": {
      "value": 25,
      "unitCode": "D10"
    },
    "type": "ExtQuantitativeValue"
  },
  "temperature": {
    "value": {
      "value": 15,
      "unitCode": "CEL"
    },
    "type": "ExtQuantitativeValue"
  },
  "tss": {
    "value": {
      "value": 200,
      "unitCode": "M1"
    },
    "type": "ExtQuantitativeValue"
  },
  "tds": {
    "value": {
```

```
      "value": 150,
      "unitCode": "M1"
    },
    "type": "ExtQuantitativeValue"
  },
  "turbidity": {
    "value": {
      "value": 343,
      "unitCode": "FTU"
    },
    "type": "ExtQuantitativeValue"
  },
  "salinity": {
    "value": {
      "value": 220
    },
    "type": "ExtQuantitativeValue"
  },
  "pH": {
    "value": {
      "value": 5
    },
    "type": "ExtQuantitativeValue"
  },
  "orp": {
    "value": {
      "value": 225,
      "unitCode": "2Z"
    },
    "type": "ExtQuantitativeValue"
  },
  "cdom": {
    "value": {
      "value": 22,
      "unitCode": "RFU"
    },
    "type": "ExtQuantitativeValue"
  }
}
```

2.3.30 WeatherForecast

This entity contains a harmonised description of a Weather Forecast. This entity is primarily associated with the vertical segments of the environment and agriculture but is applicable to many different applications.

<WeatherForecast><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`WeatherForecast`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	M	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	M	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	M	Y

<WeatherForecast><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
location	geo:json	The geo:json encoded map location (point or polygon), of this weather forecast.	M	N
dateRetrieved	DateTime	The date and time the forecast was retrieved in ISO8601 UTC format.	M	N
dateIssued	DateTime	The date and time the forecast was issued by the meteorological bureau in ISO8601 UTC format.		
weatherType	Text	The weather type. A choice from an enumerated list. One of: **`notAvailable, clearNight, sunnyDay, partlyCloudy, mist, fog, cloudy, overcast, lightRainShower, drizzle, lightRain, heavy RainShower, heavyRain, sleetShower, sleet, hailShower, hail, lightSnow Shower, lightSnow, heavySnowShower,heavySnow, thunderShower, thunder.`**	M	N

visibility	Text	A choice from an enumerated list. One of: **`unknown, veryPoor, poor, moderate, good, veryGood, excellent.`**	M	N
name	Text	The name of the weather forecast location.	M	Y
validity	Text	Includes the validity period for this forecast as a date/time range as a textvalue. The **`validity`** is in the form of **`validFrom/validTo`** **`validFrom`** -- The date and time the forecast is valid from expressed as an ISO8601 UTC format sequence of characters. **`validTo`**: The date and time the forecast is valid to expressed as an ISO8601 UTC format sequence of characters. For example: **`YYYY-MM-DDThh:mmZ/YYYY-MM-DDThh:mmZ`**	O	Y
dayMinimum	Array of text	Includes the attribute, value tuples: **`temperature, feelsLikeTemperature, relativeHumidity`** **`temperature`** -- The forecasted minimum temperature for the period in degrees Celsius. **`feelsLikeTemperature`** – The forecasted feels like temperature for the period in degrees Celsius. **`relativeHumidity`** -- The relative humidity expressed a number between 0 ≤ RelativeHumidity ≤ 1.	O	Y
dayMaximum	Array of Text	Includes the attribute, value tuples: **`temperature, feelsLikeTemperature, relativeHumidity`**	O	Y

		temperature -- The forecasted maximum temperature for the period in degrees Celsius. feelsLikeTemperature – The forecasted feels like temperature for the period in degrees Celsius. relativeHumidity -- The relative humidity expressed a number between 0 ≤ RelativeHumidity ≤ 1.		
address	PostalAddress	The weather forecast location encoded as a Schema.org PostalAddress. https://schema.org/PostalAddress	M	Y
temperature	Number	The temperature expressed in degrees Celsius.	M	Y
windDirection	Number	The wind direction expressed in degrees compared to geographic North (measured clockwise).	O	Y
windSpeed	Number	The forecasted wind speed in m/s.	O	Y
uVIndexMax	Number	The maximum UV index for the period, based on the World Health Organization's UV Index measure.	O	Y
relativeHumidity	Number	The relative humidity expressed a number between 0 ≤ RelativeHumidity ≤ 1.	O	Y
precipitationProbability	Number	The probability of precipitation, expressed as a number between 0 ≤ precipitationProbability ≤ 1.	O	Y
refPointOfInterest	Array of Reference	A JSON encode sequence of characters referencing the unique ids of the associated group of pointOfInterests.	O	Y

2.3.30.1 WeatherForecast JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/c7beae7a0e9797d2358db6cf1c190fc2

```
{
  "id": "7453c443-290d-44ef-a60f-d4c087010c88",
  "type": "WeatherForecast",
```

```
  "dateCreated": {
    "value": "2016-08-08 T10:18:16Z ",
    "type": "DateTime"
  },
  "dateModified": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "source": {
    "value": "http://www.example.com",
    "type": "URL"
  },
  "dataProvider": {
    "value": "OperatorA",
    "type": "Text"
  },
  "location": {
    "value": {
      "type": "Point",
      "coordinates": [
        -104.99404,
        39.75621
      ]
    },
    "type": "geo:json"
  },
  "dateRetrieved": {
    "value": "2016-08-16T10:18:16Z",
    "type": "DateTime"
  },
  "dateIssued": {
    "value": "2016-08-10T10:18:16Z",
    "type": "DateTime"
  },
  "weatherType": {
    "value": "sunnyDay",
    "type": "Text"
  },
  "visibility": {
    "value": "Good",
```

```
    "type": "Text"
  },
  "name": {
    "value": "London City",
    "type": "Text"
  },
  "validity": {
    "value": "2016-08-10T10:18:16Z/2016-08-29T10:18:16Z",
    "type": "Text"
  },
  "dayMinimum": [
    "temperature, 30, CEL",
    "feelsLikeTemperature, 32, CEL",
    "relativeHumidity, 0.22, P1"
  ],
  "dayMaximum": [
    "temperature, 33, CEL",
    "feelsLikeTemperature, 328, CEL",
    "relativeHumidity, 0.52, P1"
  ],
  "address": {
    "type": "PostalAddress",
    "value": {
      "addressLocality": "London",
      "postalCode": "EC4N 8AF",
      "streetAddress": "25 Walbrook"
    }
  },
  "temperature": {
    "value": 30,
    "type": "Number"
  },
  "windDirection": {
    "value": 122,
    "type": "Number"
  },
  "windSpeed": {
    "value": 3,
    "type": "Number"
  },
```

```
  "uVIndexMax": {
    "value": 5,
    "type": "Number"
  },
  "relativeHumidity": {
    "value": 0.1,
    "type": "Number"
  },
  "precipitationProbability": {
    "value": 0.05,
    "type": "Number"
  },
  "refPointOfInterest": [
     "d0d88168-780c-11e6-b934-2b9831af3c6f"
  ]
}
```

2.3.31 WeatherObserved

This entity contains a harmonised description of the weather at a particular location and time. This entity is primarily associated with the vertical segments of the environment and agriculture but is applicable to many different applications.

<WeatherObserved><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`WeatherObserved`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	M	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	M	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	M	Y

<Weather Observed><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional	May be Null
location	geo:json	The geo:json encoded map location (point or polygon), of this weather observation.	M	N
refDevice	Array of Reference	Reference to the unique ids of the device(s) which captured this weather observation.	O	Y
dateObserved	DateTime	The date and time of this weather observation in ISO8601 UTCformat.	M	N
weatherType	Text	The weather type. A choice from an enumerated list. One of: **`notAvailable, clearNight, sunnyDay, partlyCloudy, mist, fog, cloudy, overcast, lightRainShower, drizzle, lightRain, heavy RainShower, heavyRain, sleetShower, sleet, hailShower, hail, lightSnow Shower, lightSnow, heavySnowShower, heavySnow, thunderShower, thunder`**	M	N

visibility	Text	A choice from an enumerated list. One of **`unknown, veryPoor, poor, moderate, good, veryGood, excellent.`**	M	N
name	Text	The name of the weather observed location.	M	Y
address	PostalAdresss	The weather observed location encoded as a Schema.org Postal Address. https://schema.org/PostalAddress	M	Y
temperature	Number Or ExtQuantitativeValue (Number)	The recorded temperature expressed in degrees Celsius, encoded as a Number OR a ExtQuantitativeValue.	M	Y
refPointOfInterest	Array of Reference	A JSON encode sequence of characters referencing the unique ids of the associated group of pointOfInterests.	O	Y
windDirection	Number Or ExtQuantitativeValue (Number)	The wind direction expressed in degrees compared to geographic North (measured clockwise), encoded as a Number OR a ExtQuantitativeValue.	O	Y
windSpeed	Number Or ExtQuantitativeValue (Number)	The observed wind speed in m/s, encoded as a Number OR a ExtQuantitativeValue.	O	Y
relativeHumidity	Number Or ExtQuantitativeValue (Number)	The relative humidity expressed a number between 0 ≤ RelativeHumidity ≤ 1, encoded as a Number OR a ExtQuantitativeValue.	O	Y
dewPoint	Number Or ExtQuantitativeValue (Number)	The dew point in degrees Celsius, encoded as a Number OR a ExtQuantitativeValue.	O	Y
atmosphericPressure	Number Or ExtQuantitativeValue (Number)	The atmospheric pressure in units of Pascal, encoded as a Number OR a ExtQuantitativeValue.	O	Y
pressureTendency	Text Or ExtQuantitativeValue(Text)	Is the pressure is rising or falling, encoded as Text OR a ExtQuantitativeValue. A choice from an enumerated list. One of:	O	Y

		rising, falling, steady.		

2.3.31.1 WeatherObserved JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/ef466feddc874fb801b163c6c977f052


```
{
  "id": "adb144fb-e732-4944-a192-8690bd17de8c",
  "type": "WeatherObserved",
  "dateCreated": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "dateModified": {
    "value": "2016-08-08T10:18:16Z",
    "type": "DateTime"
  },
  "source": {
    "value": "http://www.example.com",
    "type": "URL"
  },
  "dataProvider": {
    "value": "OperatorA",
    "type": "Text"
  },
  "location": {
    "value": {
      "type": "Point",
      "coordinates": [
        -104.99404,
        39.75621
      ]
    },
    "type": "geo:json"
  },
  "refDevice": [
    "c3e30a5a-2697-407d-908d-02a627d32730",
    "08d22ce9-ce65-46a6-8e3c-12aa3a5389de"
  ],
```

```
  "dateObserved": {
    "value": "2016-08-16T10:18:16Z",
    "type": "DateTime"
  },
  "weatherType": {
    "value": "sunnyDay",
    "type": "Text"
  },
  "visibility": {
    "value": "veryGood",
    "type": "Text"
  },
  "name": {
    "value": "London City",
    "type": "Text"
  },
  "address": {
    "type": "PostalAddress",
    "value": {
      "addressLocality": "London",
      "postalCode": "EC4N 8AF",
      "streetAddress": "25 Walbrook"
    }
  },
  "temperature": {
    "value": {
      "value": 15,
      "unitCode": "CEL"
    },
    "type": "ExtQuantitativeValue"
  },
  "refPointofInterest": [
    "b397c472-1ca8-4605-8d35-2fb27e85c0e8",
    "e7c4d076-7eec-45b2-8982-9cd4c331e491"
  ],
  "windDirection": {
    "value": {
      "value": 122,
      "unitCode": "DD"
    },
```

```
    "type": "ExtQuantitativeValue"
  },
  "windSpeed": {
    "value": {
      "value": 3,
      "unitCode": "P87"
    },
    "type": "ExtQuantitativeValue"
  },
  "relativeHumidity": {
    "value": {
      "value": 0.2
    },
    "type": "ExtQuantitativeValue"
  },
  "dewPoint": {
    "value": {
      "value": 44,
      "unitCode": "CEL"
    },
    "type": "ExtQuantitativeValue"
  },
  "atmosphericPressure": {
    "value": {
      "value": 101325,
      "unitCode": "PAL"
    },
    "type": "ExtQuantitativeValue"
  },
  "pressureTendency": {
    "value": "Rising",
    "type": "Text"
  }
}
```

Annex A ExtQuantitativeValue and NGSIv2 metadata compatibility (Informative)

The harmonized data models defined by this document make extensive use of the ExtQuantitativeValue structure. An example of the JSON formatted syntax for an attribute of type ExtQuantitativeValue is shown below:

```
"soilTemperature" : {
      "value": {
        "value": 27,
        "unitCode": "CEL",
        "timestamp":"2016-09-07T07:09:54"
      },
      "type" : "ExtQuantitativeValue"
}
```

The identical example in the equivalent NGSIv2 attribute value plus metadata, format is shown below:

```
"soilTemperature": {
      "value": 27,
      "metadata": {
            "timestamp": {
                  "value": "2016-09-07T07:09:54",
                  "type" : "DateTime",
            }
            "unitCode": {
                  "value": "CEL",
                  "type": "Text"
            }
      },
      "type": "Number"
}
```

Both implementation approaches are equivalent and comply with this harmonised data model.

Annex B Referenced Schema.org entities (Informative)

Some members of the project group have reported difficulties in accessing https://schema.org/. To provide additional clarity we provide a snapshot of the https://schema.org/ entity definitions below. This information is informative only.

B.1 Schema.org entity descriptions: Offer

Property	Expected Type	Description
Properties from Offer		
acceptedPaymentMethod	LoanOrCredit or PaymentMethod	The payment method(s) accepted by seller for this offer.
addOn	Offer	An additional offer that can only be obtained in combination with the first base offer (e.g. supplements and extensions that are available for a surcharge).
advanceBookingRequirement	QuantitativeValue	The amount of time that is required between accepting the offer and the actual usage of the resource or service.
aggregateRating	AggregateRating	The overall rating, based on a collection of reviews or ratings, of the item.
areaServed	AdministrativeArea or GeoShape or Place or Text	The geographic area where a service or offered item is provided. Supersedes serviceArea.
availability	ItemAvailability	The availability of this item—for example In stock, Out of stock, Pre-order, etc.
availabilityEnds	DateTime	The end of the availability of the product or service included in the offer.
availabilityStarts	DateTime	The beginning of the availability of the product or service included in the offer.
availableAtOrFrom	Place	The place(s) from which the offer can be obtained (e.g. store locations).
availableDeliveryMethod	DeliveryMethod	The delivery method(s) available for this offer.
businessFunction	BusinessFunction	The business function (e.g. sell, lease, repair, dispose) of the offer or component of a bundle (TypeAndQuantityNode). The default is http://purl.org/goodrelations/v1#Sell.

Property	Expected Type	Description
category	Text or Thing	A category for the item. Greater signs or slashes can be used to informally indicate a category hierarchy.
deliveryLeadTime	QuantitativeValue	The typical delay between the receipt of the order and the goods either leaving the warehouse or being prepared for pickup, in case the delivery method is on site pickup.
eligibleCustomerType	BusinessEntityType	The type(s) of customers for which the given offer is valid.
eligibleDuration	QuantitativeValue	The duration for which the given offer is valid.
eligibleQuantity	QuantitativeValue	The interval and unit of measurement of ordering quantities for which the offer or price specification is valid. This allows e.g. specifying that a certain freight charge is valid only for a certain quantity.
eligibleRegion	GeoShape or Place or Text	The ISO 3166-1 (ISO 3166-1 alpha-2) or ISO 3166-2 code, the place, or the GeoShape for the geo-political region(s) for which the offer or delivery charge specification is valid. See also ineligibleRegion.
eligibleTransactionVolume	PriceSpecification	The transaction volume, in a monetary unit, for which the offer or price specification is valid, e.g. for indicating a minimal purchasing volume, to express free shipping above a certain order volume, or to limit the acceptance of credit cards to purchases to a certain minimal amount.
gtin12	Text	The GTIN-12 code of the product, or the product to which the offer refers. The GTIN-12 is the 12-digit GS1 Identification Key composed of a U.P.C. Company Prefix, Item Reference, and Check Digit used to identify trade items. See GS1 GTIN Summary for more details.
gtin13	Text	The GTIN-13 code of the product, or the product to which the offer refers. This is

Property	Expected Type	Description
		equivalent to 13-digit ISBN codes and EAN UCC-13. Former 12-digit UPC codes can be converted into a GTIN-13 code by simply adding a preceeding zero. See GS1 GTIN Summary for more details.
gtin14	Text	The GTIN-14 code of the product, or the product to which the offer refers. See GS1 GTIN Summary for more details.
gtin8	Text	The GTIN-8 code of the product, or the product to which the offer refers. This code is also known as EAN/UCC-8 or 8-digit EAN. See GS1 GTIN Summary for more details.
includesObject	TypeAndQuantityNode	This links to a node or nodes indicating the exact quantity of the products included in the offer.
ineligibleRegion	GeoShape or Place or Text	The ISO 3166-1 (ISO 3166-1 alpha-2) or ISO 3166-2 code, the place, or the GeoShape for the geo-political region(s) for which the offer or delivery charge specification is not valid, e.g. a region where the transaction is not allowed. See also eligibleRegion.
inventoryLevel	QuantitativeValue	The current approximate inventory level for the item or items.
itemCondition	OfferItemCondition	A predefined value from OfferItemCondition or a textual description of the condition of the product or service, or the products or services included in the offer.
itemOffered	Product or Service	The item being offered.
mpn	Text	The Manufacturer Part Number (MPN) of the product, or the product to which the offer refers.
offeredBy	Organization or Person	A pointer to the organization or person making the offer. Inverse property: makesOffer.

Property	Expected Type	Description
price	Number or Text	The offer price of a product, or of a price component when attached to PriceSpecification and its subtypes. Usage guidelines: • Use the priceCurrency property (with ISO 4217 codes e.g. "USD") instead of includingambiguous symbols such as '$' in the value. • Use '.' (Unicode 'FULL STOP' (U+002E)) rather than ',' to indicate a decimal point. Avoid using these symbols as a readability separator. • Note that both RDFa and Microdata syntax allow the use of a "content=" attribute for publishing simple machine-readable values alongside more human-friendly formatting. • Use values from 0123456789 (Unicode 'DIGIT ZERO' (U+0030) to 'DIGIT NINE' (U+0039)) rather than superficially similiar Unicode symbols.
priceCurrency	Text	The currency (in 3-letter ISO 4217 format) of the price or a price component, when attached toPriceSpecification and its subtypes.
priceSpecification	PriceSpecification	One or more detailed price specifications, indicating the unit price and delivery or payment charges.
priceValidUntil	Date	The date after which the price is no longer available.
review	Review	A review of the item. Supersedes reviews.
seller	Organization or Person	An entity which offers (sells / leases / lends / loans) the services / goods. A seller may also be a provider. Supersedes merchant, vendor.
serialNumber	Text	The serial number or any alphanumeric identifier of a particular product. When attached to an offer, it is a shortcut for the

Property	Expected Type	Description
		serial number of the product included in the offer.
sku	Text	The Stock Keeping Unit (SKU), i.e. a merchant-specific identifier for a product or service, or the product to which the offer refers.
validFrom	DateTime	The date when the item becomes valid.
validThrough	DateTime	The date after when the item is not valid. For example the end of an offer, salary period, or a period of opening hours.
warranty	WarrantyPromise	The warranty promise(s) included in the offer. Supersedes warrantyPromise.

B.2 Schema.org entity descriptions: Organisation

Property	Expected Type	Description
Properties from Organization		
address	PostalAddress or Text	Physical address of the item.
aggregateRating	AggregateRating	The overall rating, based on a collection of reviews or ratings, of the item.
alumni	Person	Alumni of an organization. Inverse property: alumniOf.
areaServed	AdministrativeArea or GeoShape or Place or Text	The geographic area where a service or offered item is provided. Supersedes serviceArea.
award	Text	An award won by or for this item. Supersedes awards.
brand	Brand or Organization	The brand(s) associated with a product or service, or the brand(s) maintained by an organization or business person.
contactPoint	ContactPoint	A contact point for a person or organization. Supersedes contactPoints.
department	Organization	A relationship between an organization and a department of that organization, also described as an organization (allowing different urls, logos, opening hours). For example: a store with a pharmacy, or a bakery with a cafe.
dissolutionDate	Date	The date that this organization was dissolved.
duns	Text	The Dun & Bradstreet DUNS number for identifying an organization or business person.
email	Text	Email address.
employee	Person	Someone working for this organization. Supersedes employees.
event	Event	Upcoming or past event associated with this place, organization, or action. Supersedes events.
faxNumber	Text	The fax number.
founder	Person	A person who founded this organization. Supersedes founders.

Property	Expected Type	Description
foundingDate	Date	The date that this organization was founded.
foundingLocation	Place	The place where the Organization was founded.
funder	Organization or Person	A person or organization that supports (sponsors) something through some kind of financial contribution.
globalLocationNumber	Text	The Global Location Number (GLN, sometimes also referred to as International Location Number or ILN) of the respective organization, person, or place. The GLN is a 13-digit number used to identify parties and physical locations.
hasOfferCatalog	OfferCatalog	Indicates an OfferCatalog listing for this Organization, Person, or Service.
hasPOS	Place	Points-of-Sales operated by the organization or person.
isicV4	Text	The International Standard of Industrial Classification of All Economic Activities (ISIC), Revision 4 code for a particular organization, business person, or place.
legalName	Text	The official name of the organization, e.g. the registered company name.
leiCode	Text	An organization identifier that uniquely identifies a legal entity as defined in ISO 17442.
location	Place or PostalAddress or Text	The location of for example where the event is happening, an organization is located, or where an action takes place.
logo	ImageObject or URL	An associated logo.
makesOffer	Offer	A pointer to products or services offered by the organization or person. Inverse property: offeredBy.
member	Organization or Person	A member of an Organization or a ProgramMembership. Organizations can be members of organizations; ProgramMembership is typically for individuals. Supersedes members,musicGroupMember. Inverse property: memberOf.

Property	Expected Type	Description
memberOf	Organization or ProgramMembership	An Organization (or ProgramMembership) to which this Person or Organization belongs. Inverse property: member.
naics	Text	The North American Industry Classification System (NAICS) code for a particular organization or business person.
numberOfEmployees	QuantitativeValue	The number of employees in an organization e.g. business.
owns	OwnershipInfo or Product	Products owned by the organization or person.
parentOrganization	Organization	The larger organization that this local business is a branch of, if any. Supersedes branchOf. Inverse property: subOrganization.
review	Review	A review of the item. Supersedes reviews.
seeks	Demand	A pointer to products or services sought by the organization or person (demand).
sponsor	Organization or Person	A person or organization that supports a thing through a pledge, promise, or financial contribution. e.g. a sponsor of a Medical Study or a corporate sponsor of an event.
subOrganization	Organization	A relationship between two organizations where the first includes the second, e.g., as a subsidiary. See also: the more specific 'department' property. Inverse property: parentOrganization.
taxID	Text	The Tax / Fiscal ID of the organization or person, e.g. the TIN in the US or the CIF/NIF in Spain.
telephone	Text	The telephone number.
vatID	Text	The Value-added Tax ID of the organization or person.

B.3 Schema.org entity descriptions: Person

Property	Expected Type	Description
Properties from Person		
additionalName	Text	An additional name for a Person, can be used for a middle name.
address	PostalAddress or Text	Physical address of the item.
affiliation	Organization	An organization that this person is affiliated with. For example, a school/university, a club, or a team.
alumniOf	EducationalOrganization or Organization	An organization that the person is an alumni of. Inverse property: alumni.
award	Text	An award won by or for this item. Supersedes awards.
birthDate	Date	Date of birth.
birthPlace	Place	The place where the person was born.
brand	Brand or Organization	The brand(s) associated with a product or service, or the brand(s) maintained by an organization or business person.
children	Person	A child of the person.
colleague	Person or URL	A colleague of the person. Supersedes colleagues.
contactPoint	ContactPoint	A contact point for a person or organization. Supersedes contactPoints.
deathDate	Date	Date of death.
deathPlace	Place	The place where the person died.
duns	Text	The Dun & Bradstreet DUNS number for identifying an organization or business person.
email	Text	Email address.
familyName	Text	Family name. In the U.S., the last name of an Person. This can be used along with givenName instead of the name property.

Property	Expected Type	Description
faxNumber	Text	The fax number.
follows	Person	The most generic uni-directional social relation.
funder	Organization or Person	A person or organization that supports (sponsors) something through some kind of financial contribution.
gender	GenderType or Text	Gender of the person. While http://schema.org/Male and http://schema.org/Female may be used, text strings are also acceptable for people who do not identify as a binary gender.
givenName	Text	Given name. In the U.S., the first name of a Person. This can be used along with familyName instead of the name property.
globalLocationNumber	Text	The Global Location Number (GLN, sometimes also referred to as International Location Number or ILN) of the respective organization, person, or place. The GLN is a 13-digit number used to identify parties and physical locations.
hasOfferCatalog	OfferCatalog	Indicates an OfferCatalog listing for this Organization, Person, or Service.
hasPOS	Place	Points-of-Sales operated by the organization or person.
height	Distance or QuantitativeValue	The height of the item.
homeLocation	ContactPoint or Place	A contact location for a person's residence.
honorificPrefix	Text	An honorific prefix preceding a Person's name such as Dr/Mrs/Mr.
honorificSuffix	Text	An honorific suffix preceding a Person's name such as M.D. /PhD/MSCSW.
isicV4	Text	The International Standard of Industrial Classification of All Economic Activities (ISIC), Revision 4 code for a particular organization, business person, or place.

Property	Expected Type	Description
jobTitle	Text	The job title of the person (for example, Financial Manager).
knows	Person	The most generic bi-directional social/work relation.
makesOffer	Offer	A pointer to products or services offered by the organization or person. Inverse property: offeredBy.
memberOf	Organization or ProgramMembership	An Organization (or ProgramMembership) to which this Person or Organization belongs. Inverse property: member.
naics	Text	The North American Industry Classification System (NAICS) code for a particular organization or business person.
nationality	Country	Nationality of the person.
netWorth	MonetaryAmount or PriceSpecification	The total financial value of the person as calculated by subtracting assets from liabilities.
owns	OwnershipInfo or Product	Products owned by the organization or person.
parent	Person	A parent of this person. Supersedes parents.
performerIn	Event	Event that this person is a performer or participant in.
relatedTo	Person	The most generic familial relation.
seeks	Demand	A pointer to products or services sought by the organization or person (demand).
sibling	Person	A sibling of the person. Supersedes siblings.
sponsor	Organization or Person	A person or organization that supports a thing through a pledge, promise, or financial contribution. e.g. a sponsor of a Medical Study or a corporate sponsor of an event.
spouse	Person	The person's spouse.

Property	Expected Type	Description
taxID	Text	The Tax / Fiscal ID of the organization or person, e.g. the TIN in the US or the CIF/NIF in Spain.
telephone	Text	The telephone number.
vatID	Text	The Value-added Tax ID of the organization or person.
weight	QuantitativeValue	The weight of the product or person.
workLocation	ContactPoint or Place	A contact location for a person's place of work.
worksFor	Organization	Organizations that the person works for.

B.4 Schema.org entity descriptions: PostalAddress

Property	Expected Type	Description
Properties from PostalAddress		
addressCountry	Country or Text	The country. For example, USA. You can also provide the two-letter ISO 3166-1 alpha-2 country code.
addressLocality	Text	The locality. For example, Mountain View.
addressRegion	Text	The region. For example, CA.
postOfficeBoxNumber	Text	The post office box number for PO box addresses.
postalCode	Text	The postal code. For example, 94043.
streetAddress	Text	The street address. For example, 1600 Amphitheatre Pkwy.

B.5 Schema.org entity descriptions: Product

Property	Expected Type	Description
Properties from Product		
additionalProperty	PropertyValue	A property-value pair representing an additional characteristics of the entity, e.g. a product feature or another characteristic for which there is no matching property in schema.org. Note: Publishers should be aware that applications designed to use specific schema.org properties (e.g. http://schema.org/width, http://schema.org/color, http://schema.org/gtin13, ...) will typically expect such data to be provided using those properties, rather than using the generic property/value mechanism.
aggregateRating	AggregateRating	The overall rating, based on a collection of reviews or ratings, of the item.
audience	Audience	An intended audience, i.e. a group for whom something was created. Supersedes serviceAudience.
award	Text	An award won by or for this item. Supersedes awards.
brand	Brand or Organization	The brand(s) associated with a product or service, or the brand(s) maintained by an organization or business person.
category	Text or Thing	A category for the item. Greater signs or slashes can be used to informally indicate a category hierarchy.
color	Text	The color of the product.
depth	Distance or QuantitativeValue	The depth of the item.
gtin12	Text	The GTIN-12 code of the product, or the product to which the offer refers. The GTIN-12 is the 12-digit GS1 Identification Key composed of a U.P.C. Company Prefix, Item Reference, and Check Digit used to identify

Property	Expected Type	Description
		trade items. See GS1 GTIN Summary for more details.
gtin13	Text	The GTIN-13 code of the product, or the product to which the offer refers. This is equivalent to 13-digit ISBN codes and EAN UCC-13. Former 12-digit UPC codes can be converted into a GTIN-13 code by simply adding a preceeding zero. See GS1 GTIN Summary for more details.
gtin14	Text	The GTIN-14 code of the product, or the product to which the offer refers. See GS1 GTIN Summary for more details.
gtin8	Text	The GTIN-8 code of the product, or the product to which the offer refers. This code is also known as EAN/UCC-8 or 8-digit EAN. See GS1 GTIN Summary for more details.
height	Distance or QuantitativeValue	The height of the item.
isAccessoryOrSparePartFor	Product	A pointer to another product (or multiple products) for which this product is an accessory or spare part.
isConsumableFor	Product	A pointer to another product (or multiple products) for which this product is a consumable.
isRelatedTo	Product or Service	A pointer to another, somehow related product (or multiple products).
isSimilarTo	Product or Service	A pointer to another, functionally similar product (or multiple products).
itemCondition	OfferItemCondition	A predefined value from OfferItemCondition or a textual description of the condition of the product or service, or the products or services included in the offer.
logo	ImageObject or URL	An associated logo.
manufacturer	Organization	The manufacturer of the product.
model	ProductModel or Text	The model of the product. Use with the URL of a ProductModel or a textual representation of

Property	Expected Type	Description
		the model identifier. The URL of the ProductModel can be from an external source. It is recommended to additionally provide strong product identifiers via the gtin8/gtin13/gtin14 and mpn properties.
mpn	Text	The Manufacturer Part Number (MPN) of the product, or the product to which the offer refers.
offers	Offer	An offer to provide this item—for example, an offer to sell a product, rent the DVD of a movie, perform a service, or give away tickets to an event.
productID	Text	The product identifier, such as ISBN. For example: `meta itemprop="productID" content="isbn:123-456-789"`.
productionDate	Date	The date of production of the item, e.g. vehicle.
purchaseDate	Date	The date the item e.g. vehicle was purchased by the current owner.
releaseDate	Date	The release date of a product or product model. This can be used to distinguish the exact variant of a product.
review	Review	A review of the item. Supersedes reviews.
sku	Text	The Stock Keeping Unit (SKU), i.e. a merchant-specific identifier for a product or service, or the product to which the offer refers.
weight	QuantitativeValue	The weight of the product or person.
width	Distance or QuantitativeValue	The width of the item.

B.6 Schema.org entity descriptions: QuantitativeValue

Property	Expected Type	Description
Properties from QuantitativeValue		
additionalProperty	PropertyValue	A property-value pair representing an additional characteristics of the entitity, e.g. a product feature or another characteristic for which there is no matching property in schema.org. Note: Publishers should be aware that applications designed to use specific schema.org properties (e.g. http://schema.org/width, http://schema.org/color, http://schema.org/gtin13, ...) will typically expect such data to be provided using those properties, rather than using the generic property/value mechanism.
maxValue	Number	The upper value of some characteristic or property.
minValue	Number	The lower value of some characteristic or property.
unitCode	Text or URL	The unit of measurement given using the UN/CEFACT Common Code (3 characters) or a URL. Other codes than the UN/CEFACT Common Code may be used with a prefix followed by a colon.
unitText	Text	A string or text indicating the unit of measurement. Useful if you cannot provide a standard unit code for unitCode.
value	Boolean or Number or StructuredValue or Text	The value of the quantitative value or property value node. • For QuantitativeValue and MonetaryAmount, the recommended type for values is 'Number'. • For PropertyValue, it can be 'Text;', 'Number', 'Boolean', or 'StructuredValue'.
valueReference	Enumeration or PropertyValue or QualitativeValue or QuantitativeValue or StructuredValue	A pointer to a secondary value that provides additional information on the original value, e.g. a reference temperature.

B.7 Schema.org entity descriptions: Vehicle

Property	Expected Type	Description
Properties from Vehicle		
cargoVolume	QuantitativeValue	The available volume for cargo or luggage. For automobiles, this is usually the trunk volume. Typical unit code(s): LTR for liters, FTQ for cubic foot/feet Note: You can use minValue and maxValue to indicate ranges.
dateVehicleFirstRegistered	Date	The date of the first registration of the vehicle with the respective public authorities.
driveWheelConfiguration	DriveWheelConfigurationValue or Text	The drive wheel configuration, i.e. which roadwheels will receive torque from the vehicle's engine via the drivetrain.
fuelConsumption	QuantitativeValue	The amount of fuel consumed for traveling a particular distance or temporal duration with the given vehicle (e.g. lites per 100 km). • Note 1: There are unfortunately no standard unit codes for liters per 100 km. Use unitText to indicate the unit of measurement, e.g. L/100 km. • Note 2: There are two ways of indicating the fuel consumption, fuelConsumption(e.g. 8 liters per 100 km) and fuelEfficiency (e.g. 30 miles per gallon). They are reciprocal. • Note 3: Often, the absolute value is useful only when related to driving speed ("at 80 km/h") or usage pattern ("city traffic"). You can use valueReference to link the value for the fuel consumption to another value.

Property	Expected Type	Description
fuelEfficiency	QuantitativeValue	The distance traveled per unit of fuel used; most commonly miles per gallon (mpg) or kilometers per liter (km/L). • Note 1: There are unfortunately no standard unit codes for miles per gallon or kilometers per liter. Use unitText to indicate the unit of measurement, e.g. mpg or km/L. • Note 2: There are two ways of indicating the fuel consumption, fuelConsumption(e.g. 8 liters per 100 km) and fuelEfficiency (e.g. 30 miles per gallon). They are reciprocal. • Note 3: Often, the absolute value is useful only when related to driving speed ("at 80 km/h") or usage pattern ("city traffic"). You can use valueReference to link the value for the fuel economy to another value.
fuelType	QualitativeValue or Text or URL	The type of fuel suitable for the engine or engines of the vehicle. If the vehicle has only one engine, this property can be attached directly to the vehicle.
knownVehicleDamages	Text	A textual description of known damages, both repaired and unrepaired.
mileageFromOdometer	QuantitativeValue	The total distance travelled by the particular vehicle since its initial production, as read from its odometer. Typical unit code(s): KMT for kilometers, SMI for statute miles
numberOfAirbags	Number or Text	The number or type of airbags in the vehicle.
numberOfAxles	Number or QuantitativeValue	The number of axles. Typical unit code(s): C62
numberOfDoors	Number or QuantitativeValue	The number of doors. Typical unit code(s): C62
numberOfForwardGears	Number or QuantitativeValue	The total number of forward gears available for the transmission system of the vehicle. Typical unit code(s): C62

Property	Expected Type	Description
numberOfPreviousOwners	Number or QuantitativeValue	The number of owners of the vehicle, including the current one. Typical unit code(s): C62
productionDate	Date	The date of production of the item, e.g. vehicle.
purchaseDate	Date	The date the item e.g. vehicle was purchased by the current owner.
steeringPosition	SteeringPositionValue	The position of the steering wheel or similar device (mostly for cars).
vehicleConfiguration	Text	A short text indicating the configuration of the vehicle, e.g. '5dr hatchback ST 2.5 MT 225 hp' or 'limited edition'.
vehicleEngine	EngineSpecification	Information about the engine or engines of the vehicle.
vehicleIdentificationNumber	Text	The Vehicle Identification Number (VIN) is a unique serial number used by the automotive industry to identify individual motor vehicles.
vehicleInteriorColor	Text	The color or color combination of the interior of the vehicle.
vehicleInteriorType	Text	The type or material of the interior of the vehicle (e.g. synthetic fabric, leather, wood, etc.). While most interior types are characterized by the material used, an interior type can also be based on vehicle usage or target audience.
vehicleModelDate	Date	The release date of a vehicle model (often used to differentiate versions of the same make and model).
vehicleSeatingCapacity	Number or QuantitativeValue	The number of passengers that can be seated in the vehicle, both in terms of the physical space available, and in terms of limitations set by law. Typical unit code(s): C62 for persons.

Property	Expected Type	Description
vehicleSpecialUsage	Text	Indicates whether the vehicle has been used for special purposes, like commercial rental, driving school, or as a taxi. The legislation in many countries requires this information to be revealed when offering a car for sale.
vehicleTransmission	QualitativeValue or Text or URL	The type of component used for transmitting the power from a rotating power source to the wheels or other relevant component(s) ("gearbox" for cars).

Annex C Document Management

C.1 Document History

Version	Date	Brief Description of Change	Approval Authority	Editor / Company
0.10	8 Sept 16	New PRD - first draft	PSMC	Allan Bartlett / GSMA
1.0	11 Oct 16	Approved first version	PSMC	Allan Bartlett / GSMA

C.2 Other Information

Type	Description
Document Owner	Connected Living – IoT Big Data Project
Editor / Company	Allan Bartlett / GSMA

It is our intention to provide a quality product for your use. If you find any errors or omissions, please contact us with your comments. You may notify us at prd@gsma.com

Your comments or suggestions & questions are always welcome.