IoT Big Data Harmonised Data Model
Version 5.0
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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 Technology Group being the approval authority.

1.3 Abbreviations

Term	Description
3D	Three Dimensional
CAM	Computer Aided Manufacturing
CNC	Computer Numerical Control
DTC	Diagnostic Trouble Codes
GPC	Global Product Classification
GTIN	Global Trade Item Number
IoT	Internet of Things
IoTBD	Internet of Things Big Data
JSON	JavaScript Object Notation
UN/CEFACT	United Nations Centre for Trade Facilitation and Electronic Business
URL	Uniform Resource Locator
US EPA	United States Environmental Protection Agency

Term	Description
UTC	Universal Time Coordinated
UV	Ultra Violet
VIN	vehicle identification number

1.4 Unit Codes

Unit Code	Description
CEL[11]	Degree Celsius
FTU[11]	Formazin Turbidity Unit
GQ[11]	microgram per cubic metre
H29[11]	microgram per litre
kg	kilogrammes
KMT[11]	kilometres
kW/m^2	kilo watts per square metre
M1[11]	milligramper litre
mg/L	milligrams per litre
m/s	meters per second
mV	milliVolts
ppb	parts per billion
ppt	parts per thousand
ppm	parts per million
RFU[11]	relative fluorescence units
SMI[11]	Miles
S/m	Siemens per meter

1.5 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/
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/

Ref	Doc Number	Title
8.	Lower camel case	https://en.wikipedia.org/wiki/CamelCase
9.	GSMA PRD CLP.25	IoT Big Data Framework Architecture
10.	GSMA PRD CLP.24	IoT Big Data NGSIv2 Profile
11.	UN/CEFACT Unit Codes	https://www.unece.org/fileadmin/DAM/cefact/recommendations/rec20/rec20_rev3_Annex2e.pdf

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):

1. Agriculture
2. Automotive
3. Environment
4. Industry
5. Smart City
6. 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
List	An ordered list of values that are referenced by numerical index. Lists
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 date and time 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 3 vocabulary wherever possible.

<Entity Name><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	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. This will usually be allocated by the storage platform.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity. This will usually be allocated by the storage platform. A null value in this field or a value equivalent to dateCreated means the entity has not been modified since being created.	O	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.	R	Y
dataProvider	Text	A sequence of characters identifying the provider of the harmonised data entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits	R	Y

		representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"		

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/ Recommended	May be Null
specificMan1	A valid attribute type	Some text describing a mandatory attribute which may not be null.	M	N
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.

Note: That individual data providers may provide extensions to the harmonised data model which are specific to their implementations/ markets. Applications should therefore be written to accept additional attributes without throwing an error, and developers should consult implementation notes from data publishers to see if there are any extensions available to the harmonised data models.

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/ Recommended	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.	O	Y
source	URL	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<AgriCrop><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	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.	R	Y
refAgriSoil	List of Reference	A List containing a JSON encoded sequence of characters that reference the unique Ids of the recommended soil(s).	O	Y
refAgriFertilizer	List of Reference	A List containing a JSON encoded sequence of characters that reference the unique Ids of the	O	Y

		recommended fertiliser product(s).		
refAgriPest	List of Reference	A List containing a JSON encoded sequence of characters that reference the unique Ids of the pest(s) known to attack this crop.	O	Y
plantingFrom	List	A List containing a JSON encoded sequence of characters of the recommended planting 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 from this start date to this end date.	O	Y
harvestingInterval	List	A list 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/c02633ceaab7f18afd489b559d2ab0f4

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/ Recommended	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.	O	Y
source	URL	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<AgriGreenHouse><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	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 representing the range 0% to	R	Y

		100 (%). 0 ⩽ relativeHumidity ⩽ 1 Encoded as a ExtQuantitiativeValue		
refAgriParcelRecord	List of Reference	Related AgriParcelRecords for this greenhouse.	O	Y
leafTemperature	ExtQuantitativeValue(Number)	The average greenhouse air temperature in degrees centigrade. Encoded as a ExtQuantitiativeValue.	R	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	List 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/7936c30b050b698eed3fecfe43773b7a

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/ Recommended	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.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<AgriParcel><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	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.	R	Y
category	List	A choice of one or more values from an enumerated list describing the parcel category. **`greenhouse,`**	R	Y

		irrigated, rainfed.		
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: **seeded, justBorn, growing, maturing, readyForHarvesting.**	R	Y
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 date and time the AgriCrop was planted in UTC.	R	Y
refDevice	List 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/b82444f8ace1a379215b0b70a93d0bf5

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/ Recommended	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.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<AgriParcelOperation><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	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.`**	R	Y
description	Text	A description of the operation.	R	Y

result	Text	A description of the results of the operation. One of: **`ok, aborted, failed.`**	R	Y
startDate	DateTime	The planned start timestamp for the operation.	M	N
endDate	DateTime	The planned end timestamp for the operation. Note that this is advisory and the actual time the operation finishes may be before or after the planned endDate.	M	N
status	Text	A choice from an enumerated list describing the status. One of: **`planned, ongoing, finished, scheduled, cancelled.`**	R	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.	R	Y
dateFinished	DateTime	Timestamp when the operation actually finished.	R	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/6901c2e6f42ac5d21a8c5bbc7d8eb6fa

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/ Recommended	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.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<AgriParcelRecord><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	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	ExtQuantita	The observed air temperature in	R	Y

	tiveValue(Number)	degrees centigrade encoded as a ExtQuantitativeValue.		
soilMoistureVwc	ExtQuantitativeValue(Number)	Measured as Volumetric Water Content, VWC as a percentage. $0 \leqslant$ soilMoistureVwc $\leqslant 1$ 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 representing the range of 0% to 100% $0 \leqslant$ relativeHumidity $\leqslant 1$ encoded as a ExtQuantitativeValue.	R	Y
atmosphericPressure	ExtQuantitativeValue(Number)	Atmospheric Pressure in units of hecto Pascals encoded as a ExtQuantitativeValue.	O	Y
description	Text	Description of this AgriParcelRecord.	R	Y

2.3.5.1 AgriParcelRecord JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/fbd5aeff87e6b73322bea447d5b0bb94

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/ Recommended	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.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<AgriPest><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	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.	R	Y
refAgriProduct	List of Reference	A List 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/df22eca28701a239b49cc744be8eb1ad

2.3.7 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/ Recommended	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.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<AgriProductType><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	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	List of Reference	A JSON encoded sequence of characters referencing the unique ids of the AgriProductType groupings this AgriProductType is a member of.	O	Y

2.3.7.1 AgriProductType JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/6f5b29763c09d621f7e154e69d18a02c

2.3.8 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/ Recommended	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.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<AgriSoil><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	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.	R	Y
refAgriProduct	List of Reference	A List containing a JSON encoded sequence of characters referencing the unique ids of the recommended AgriProduct fertiliser (or other) product(s).	O	Y

2.3.8.1 AgriSoil JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/a3eae9503c856c835b56c8c98603cd5f

2.3.9 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/ Recommended	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.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<AirQualityObserved><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
refPOI	Reference	A reference to the unique ids of the Point of Interest (monitoring station) that originated this observation.	O	Y
refDevice	List of Reference	A list of references to the unique ids of the devices that originated this observation.	O	Y
location	geo:json	The geo:json encoded polygon or	M	N

		point location, of this observation.		
dateObserved	DateTime	The date and time of this observation in ISO8601 UTC format.	R	Y
PM2.5	ExtQuantitativeValue	**value --- Measured value** **timestamp --- date and time when measurement was taken** **unitCode --- normally GQ** **unitText --- normally microgram per cubic metre** **additonalProperty airQualityLevel a choice from an enumerated list (*good,moderate,unhealthyForSensitiveGroups,unhealthy,veryUnhealthy,hazardous*)** **valueReference a choice from an enumerated list determined according to the (US EPA standard, EU standard, UK standard.)**	O	Y
PM10	ExtQuantitativeValue	**value --- Measured value** **timestamp --- date and time when measurement was taken** **unitCode --- normally GQ** **unitText --- normally microgram per cubic metre** **additonalProperty airQualityLevel a choice from an enumerated list (*good,moderate,unhealthyForSensitiveGroups,unhealthy,veryUnhealthy,hazardous*)** **valueReference a choice from an enumerated list determined according to the (US EPA standard, EU standard, UK standard.)**	O	Y
CO	ExtQuantitativeValue	**value --- Measured value** **timestamp --- date and time when measurement was taken** **unitCode --- normally GQ** **unitText --- normally**	O	Y

		microgram per cubic metre **additonalProperty** **airQualityLevel a choice from an enumerated list (*good,moderate,unhealthyForSensitiveGroups,unhealthy,veryUnhealthy,hazardous*)** **valueReference a choice from an enumerated list determined according to the (US EPA standard, EU standard, UK standard.)**		
O3	ExtQuantitativeValue	**value --- Measured value** **timestamp --- date and time when measurement was taken** **unitCode --- normally GQ** **unitText --- normally microgram per cubic metre** **additonalProperty** **airQualityLevel a choice from an enumerated list (*good,moderate,unhealthyForSensitiveGroups,unhealthy,veryUnhealthy,hazardous*)** **valueReference a choice from an enumerated list determined according to the (US EPA standard, EU standard, UK standard.)**	O	Y
SO2	ExtQuantitativeValue	**Value --- Measured value** **timestamp --- date and time when measurement was taken** **unitCode --- normally GQ** **unitText --- normally microgram per cubic metre** **additonalProperty** **airQualityLevel a choice from an enumerated list (*good,moderate,unhealthyForSensitiveGroups,unhealthy,veryUnhealthy,hazardous*)** **valueReference a choice from an enumerated list determined according to the (US EPA standard, EU standard, UK standard.)**	O	Y

NO	ExtQuantitativeValue	**value --- Measured value** **timestamp --- date and time when measurement was taken** **unitCode --- normally GQ** **unitText --- normally microgram per cubic metre** **additonalProperty airQualityLevel a choice from an enumerated list (*good,moderate,unhealthyForSensitiveGroups,unhealthy,veryUnhealthy,hazardous*)** **valueReference a choice from an enumerated list determined according to the (US EPA standard, EU standard, UK standard.)**	O	Y
NO2	ExtQuantitativeValue	**value --- Measured value** **timestamp --- date and time when measurement was taken** **unitCode --- normally GQ** **unitText --- normally microgram per cubic metre** **additonalProperty airQualityLevel a choice from an enumerated list (*good,moderate,unhealthyForSensitiveGroups,unhealthy,veryUnhealthy,hazardous*)** **valueReference a choice from an enumerated list determined according to the (US EPA standard, EU standard, UK standard.)**	O	Y
NOx	ExtQuantitativeValue	**value --- Measured value** **timestamp --- date and time when measurement was taken** **unitCode --- normally GQ** **unitText --- normally microgram per cubic metre** **additonalProperty airQualityLevel a choice from an enumerated list (*good,moderate,unhealthyForSensitiveGroups,unhealthy,veryUnhealthy,hazardous*)** **valueReference a choice from an enumerated list determined according to the (US EPA standard, EU**	O	Y

		standard, UK standard.)		
airQualityIndex	ExtQuantitativeValue	**Value Calculated Air Quality Index value. valueReference a choice from an enumerated list calculated according to the (US EPA standard, EU standard, UK standard.)** [1]	O	Y

2.3.9.1 AirQualityObserved JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/d1e46adc706d986ee9e752a5b425bcca

[1] https://cfpub.epa.gov/airnow/index.cfm?action=aqibasics.aqi

2.3.10 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/ Recommended	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.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<Building><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
refBuildingType	Reference	Refers to the buildingType that this building is an instance of.	M	N
category	List	One or more categories relevant to the building with choices based on for example http://wiki.openstreetmap.org/wiki/Map_Features#Building	R	Y
containedInPlace	geo:json	The geo:json encoded polygon of the building plot in which this building sits.	R	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	R	Y
owner	List of references to Person(s) or Organization(s)	A List 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	R	Y
occupier	List of references to Person(s) or Organization(s)	A List 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	R	Y
refSubscriptionService	List of Reference	A List 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.	R	Y
mapUrl	URL	A URL to a mapping service which shows the location of the building.	O	Y
notes	List	Free format notes relating to the building e.g. published occupants, opening hours etc.	O	Y

2.3.10.1 Building JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/69f8893b605894640e3b99f82c3f20ed

2.3.11 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/ Recommended	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.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<BuildingOperation><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	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	R	Y

		types specific to the building.		
description	Text	A description of the operation.	R	Y
result	Text	A description of the results of the operation. One of **`ok, aborted, failed`**	R	Y
startDate	DateTime	The planned start timestamp for the operation.	M	N
endDate	DateTime	The planned end timestamp for the operation. Note that this is advisory and the actual time the operation finishes may be before or after the planned endDate.	M	N
status	Text	A choice from an enumerated list describing the status. One of: **`planned, ongoing, finished, scheduled, cancelled`**	R	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.	R	Y
dateFinished	DateTime	Timestamp when the operation actually finished.	R	Y
operationSequence	Text	The sequence of operations executed/ requested for the building in a representation format relevant to the building.	O	Y
refRelatedBuilding Operation	List of Reference	A List containing a JSON encoded sequence of characters referencing the unique ids of any related building operations.	O	Y
refRelatedOperation	List of Reference	A List containing a JSON encoded sequence of characters referencing the unique ids of any related operations (device, machine or other).	O	Y

2.3.11.1 BuildingOperation JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/2c15fe4070fbbf5ed5227ccabf19b639

2.3.12 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/ Recommended	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.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<BuildingType><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
name	Text	The name of this BuildingType.	M	N
description	Text	A description of this type.	R	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.	M	Y
refParentType	List of Reference	A List containing a JSON encoded sequence of characters referencing	O	Y

		the unique Ids of the building type groupings this BuildingType is a member of.		

2.3.12.1 BuildingType JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/8e82b3af9d333ca56658acff1a6f20ca

2.3.13 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/ Recommended	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.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<Device><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	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.	R	Y

manufacturerCountry	Text	The country where this device was manufactured.	R	Y
factory	Text	The factory name/code manufacturing this device.	O	Y
dateManufactured	DateTime	The ISO8601 sequence of characters at which date and time the device was manufactured in UTC.	M	N
description	Text	An optional description of this device.	R	Y
owner	List of Reference	A List 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
dateInstalled	DateTime	The ISO8601 sequence of characters at which date and time the device was installed in UTC.	R	N
dateFirstUsed	DateTime	The ISO8601 sequence of characters at which date and time the device was first used in UTC.	R	N
hardwareVersion	Text	The hardware version of this device.	R	N
firmwareVersion	Text	The firmware version of this device.	R	N
softwareVersion	Text	The software version of this device.	R	N
osVersion	Text	The operating system version of this device.	R	N
supportedProtocol	List	A List element per supported communication protocol.	O	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 (false) or Online (true).	O	N
status	Text	The text format (current) device status code or description. Expected to be the manufacturer or device specific status code generated by the device.	R	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.	O	Y

		Null when it cannot be determined. Normally encoded as an ExtQuantitativeValue.		
value	ExtQuantitativeValue (Number)	The observed or reported value of the device. For control applications the value can be updated to change the device/ actuator setting. The value is encoded as an ExtQuantitativeValue.	R	Y

2.3.13.1 Device JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/b29f6f3841d778d455e58fcad74c637d

2.3.14 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/ Recommended	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.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<DeviceModel><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	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.	R	Y
category	List	A choice from an enumerated list defining the category of this device	O	Y

		including: **`sensor, actuator, meter, appliance, heater, chiller, lighting, boiler, vessel, airHandlingUnit, consumer, other.`**		
description	Text	A description of this DeviceModel .	R	Y
manufacturerName	Text	The name of manufacturer of this DeviceModel.	R	Y
brandName	Text	A description of the brand name of this DeviceModel.	R	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.	R	Y
refParentDeviceModel	List of Reference	A List 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

2.3.14.1 DeviceModel JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/c4765078362cfebd61909fc92b27b4ee

2.3.15 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/ Recommended	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.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<DeviceOperation><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
refDevice	Reference	The unique entity Id of the device to which this device operation relates.	M	N
operationType	List	Choice form an enumerated list including: **`event, maintenance, fault, installation, upgrade, other.`**	R	Y
description	Text	A description of the operation.	R	Y
result	Text	A description of the results of the operation. One of	R	Y

		ok, **aborted, failed**		
startDate	DateTime	The planned start timestamp for the operation.	M	N
endDate	DateTime	The planned end timestamp for the operation. Note that this is advisory and the actual time the operation finishes may be before or after the planned endDate.	M	N
status	Text	A choice from an enumerated list describing the status. One of: **planned, ongoing, finished, scheduled, cancelled.**	R	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.	R	Y
dateFinished	DateTime	Timestamp when the operation actually finished.	R	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

2.3.15.1 DeviceOperation JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/dbaba83f8fab072c6a4765823228cc12

2.3.16 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/ Recommended	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.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<EnvironmentObserved><Entity Specific Attributes>

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

refAirQualityObserved	List of Reference	A List containing a JSON encoded sequence of characters that reference the unique ids of the related AirQualityObserved entities.	O	Y
refWaterQualityObserved	List of Reference	A List containing a JSON encoded sequence of characters that reference the unique ids of the related WaterQuality entities.	O	Y

2.3.16.1 EnvironmentObserved JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/63d18a7f5845aa201c9470d84b7912f8

2.3.17 FleetVehicle

This entity contains a harmonised description of a generic fleet vehicle such as a delivery vehicle, an ambulance or a postal vehicle. This entity is primarily associated with the vertical segment of the transport and logistics but may also be used many other related IoT applications.

<FleetVehicle><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`FleetVehicle`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<FleetVehicle><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
refVehicle	Reference	A a JSON encoded sequence of characters that reference the unique id of the related Vehicle entity that describes the core attributes of this Fleet Vehicle.	M	N

fleetVehicleType	Text	The type of the Vehicle for example, Taxi, Ambulance, Postal, Fire & Rescue, Delivery. This is free text.	M	N
operatingCompany	Organization	A JSON encoded sequence of characters referencing the unique Ids of the operating company of this fleet vehicle. Related to a Schema.org organization. https://schema.org/Organization	M	N
operator	Person	The usual operator/driver/keeper of this fleet vehicle encoded as a Schema.org person. https://schema.org/Person Should be null if there is no usual operator/driver/keeper.	R	Y

2.3.17.1 FleetVehicle JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/0bc781dd5279766aa50edcb1ee03907d

2.3.18 FleetVehicleOperation

This entity contains a harmonised description of a generic fleet vehicle operation such as a delivery, or a postal collection. This entity is primarily associated with the vertical segment of the transport and logistics but may also be used many other related IoT applications.

<FleetVehicleOperation><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`FleetVehicleOperation`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<FleetVehicleOperation><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
refFleetVehicle	Reference	A a JSON encoded sequence of characters that reference the unique id of the related FleetVehicle entity to which this operation relates.	M	N
refFleetVehicleStatus	Reference	A a JSON encoded sequence of characters that reference the unique id of the related the current FleetVehicleStatus entity to which	R	Y

		this operation relates. (e.g. speed, bearing, location)		
initiatingLocation	Geo:json	The geo:json encoded GPS location of the point from where the service was requested e.g. the location of the person who called for an ambulance.	M	N
eventStart	DateTime	The start date and time when the event or operation was triggered	M	N
eventEnd	DateTime	The end date and time of the event when the event or operation is known to be over/ complete. Null if not ended.	O	Y
operationType	Text	The type of the event or operation e.g. e.g. Call for a patient transportation, postal collection, delivery, close to a restricted area, overspeed	M	N
description	Text	The description of the event or operation	O	Y
result	Text	The final result of the event or operation	R	Y
responseTime	ExtQuantitativeValue(Number	Indicates the time to respond to an event, in seconds. The date and timestamp indicates when the last update was recorded. E.g. records the response time for an ambulance to reach to a patient	M	N
transportTime	ExtQuantitativeValue(Number	Indicates the time that the fleet vehicle has spent transporting people or supplies for the current operation. E.g. indicates the time an ambulance spent transporting a patient to a hospital emergency department	M	N

2.3.18.1 FleetVehicleOperation JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/b60e557062647abec96d1899b66c9b01

2.3.19 FleetVehicleStatus

This entity contains a harmonised description of the status of a generic fleet vehicle. This entity is primarily associated with the vertical segment of the transport and logistics but may also be used many other related IoT applications.

<FleetVehicleStatus><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`FleetVehicleStatus`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<FleetVehicleStatus><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
refFleetVehicle	Reference	A a JSON encoded sequence of characters that reference the unique id of the related FleetVehicle entity to which this status report relates.	M	N
restFuelAmount	ExtQuantitativeValue (Number)	The level of fuel recorded when the vehicle was last at rest (i.e. stopped). The timestamp element of the attribute should indicate when the	M	N

		vehicle was last at rest. Data to be recorded in Litres.		
lastFuellingAmount	ExtQuantitativeValue (Number)	The level of fuel added to the vehicle at the last fuelling. The timestamp element of the attribute should indicate when the vehicle was fuelled. Data tobe recorded in Litres.	M	N
currentStatus	Text	A description of the current status of the vehicle e.g. deployed, finished, terminated, servicing, starting	R	Y
currentOperative	Person	The current operative (e.g. driver) of the vehicle encoded as a Schema.org person. https://schema.org/Person Null if not known.	R	Y
speed	ExtQuantitativeValue(Number)	The current speed of the fleet vehicle (km/h). The timestamp element of the attribute should indicate when the reading was obtained.	O	Y
bearing	ExtQuantitativeValue(Number)	The current bearing of the fleet vehicle in degrees relative to North. The timestamp element of the attribute should indicate when the reading was obtained.	O	Y
lastKnownPositiont	Geo:json	The current, real time geo:json encoded GPS location of the fleet vehicle	M	N
lastKnownPosition Update	DateTimer	The timestamp of the last known position update for the fleet vehicle	M	N
inRestrictedArea	Boolean	Indicates if the vehicle is known to be in a restricted area at the time of the status update	R	Y
mileageFromOdometer	Number or ExtQuantitativeValue(Number	The total distance the fleet vehicle has travelled according to the on-board odometer in kilometres (unitCode KMT) or miles (unitCode SMI). If Number is used the units are assumed to be kilometres. references Schema.org Vehicle/ mileageFromOdometer.	M	N

2.3.19.1 FleetVehicleStatus JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/77f5e38611740b5795415cba62468a3d

2.3.20 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/ Recommended	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.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<Machine><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	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.	R	N
status	Text	A manufacturer specific text format machine status code or description. It is an aggregation of dynamic	R	Y

		information about the machine.		
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
factory	Text	The factory name/code manufacturing this machine.	O	Y
dateManufactured	DateTime	The ISO8601 sequence of characters at which date and time the machine was manufactured in UTC.	R	Y
dateInstalled	DateTime	The ISO8601 sequence of characters at which date and time the machine was installed in UTC.	R	Y
dateFirstUsed	DateTime	The ISO8601 sequence of characters at which date and time the machine was first used in UTC.	R	Y
online	Boolean	Identifies the communication status of the machine, online if set to TRUE.	R	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	List of Reference	A List 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	List of Reference	A List 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.	R	Y
voltage	ExtQuantitativeValue	The required supply voltage, in volts	R	Y
current	ExtQuantitativeValue	The required supply current, in amps	R	Y
power	ExtQuantitativeValue	The nominal rated power consumption of the machine in kW	R	Y
speed	ExtcurrQuantitativeValue	The maximum rotational speed in rpm	R	Y

2.3.20.1 Machine JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/7b8303207db9fd5b7cf933ca360a5dd7

2.3.21 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/ Recommended	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.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<MachineModel><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
name	Text	The name given to this machine model.	M	N
description	Text	A description of this machine model.	R	Y
manufacturerName	Text	The name of manufacturer of this machine model.	R	Y
brandName	Text	A description of this machine model brand name.	R	Y

version	Text	The manufacturer defined version number for the machine model.	R	Y
category	List	A List of functional categories which this machineModel supports. Examples include: **`robot, cnc, 2dPrinter, 3dPrinter, 3dScanner, lathe, injectionMolding, laserCutter, millingMachine, grindingMachine, stampingMachine, oven, kiln, packaging, mixer, dryer, fan, saw.`**	O	Y
doc	URL	Reference to Product Data Sheet or other manufacturers documentation about this machine.	R	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.	R	Y
refParentModel	List of Reference	A List 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	List	Lists the standard set of operations supported by this machineModel.	O	Y

2.3.21.1 MachineModel JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/d292853b17e78269856715a005b7a733

2.3.22 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/ Recommended	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.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<MachineOperation><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	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. Including; process,	M	N

		setup，maintenance, repair，breakdown. The list of operation types highly depends on the machine model.		
description	Text	A description of the operation conducted or applied.	R	Y
result	Text	A description of the results of the operation. One of: **`ok`**, **`success`**,**`suspended`**, **`aborted`**, **`failed`**.	R	Y
startDate	DateTime	The planned start timestamp for the operation.	R	Y
endDate	DateTime	The planned end timestamp for the operation. Note that this is advisory and the actual time the operation finishes may be before or after the planned endDate.	R	Y
status	Text	A choice from an enumerated list describing the status. One of: **`planned`**, **`ongoing`**, **`finished`**, **`scheduled`**, **`cancelled`**.	R	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
commandSequence	Text	The command sequence executed/ requested for the machine in a representation format relevant to the machine.	O	Y
operationOutput	Text	The text describing the output data of the operation. The schema of the output highly depends the machine model. One example of the output is for the processed goods of the machine, and the format can be: “length XX, type XX”	O	Y

2.3.22.1 MachineOperation JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/32169966d47e0e128bb37fe08937dfd3

2.3.23 MarketPriceForecast

This entity contains a harmonised description of a generic commodity, crop or product price forecast that varies over time (a spot price forecast). This entity is primarily associated with the agricultural vertical and related IoT applications.

<MarketPriceForecast><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	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	Must be equal to "**`MarketPriceForecast`**".	M	N
dateCreated	DateTime	Entity creation timestamp. This will usually be allocated by the storage platform.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity. This will usually be allocated by the storage platform. A null value in this field or a value equivalent to dateCreated means the entity has not been modified since being created.	O	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.	R	Y
dataProvider	Text	A sequence of characters identifying the provider of the harmonised data entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<MarketPriceForecast><EntitySpecificAttributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
refEntityInstance	Reference	A reference to the unique id of the	M	N

		Entity to which this record relates.		
priceForecast	PStructured Value	The market price forecast represented using schema.org PriceSpecification attributes http://schema.org/PriceSpecification	M	N
address	PostalAddress	The market location for this forecast encoded as a Schema.org PostalAddress. https://schema.org/PostalAddress	M	N
marketScale	TStructured Value	Unique code assigned to market scale type. The content includes both a name and a value. "Wholesale":Wholesale market price "Retail":Retail market price for example (ex) {'name':'Wholesale', 'value':"02"} or {'name':'Retail', 'value':"01"}	M	N
refWeatherForecast	Reference	A reference to the unique id of the related weather forecast record.	O	Y

2.3.23.1 MarketPriceForecast JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/971cc478edf6c534b3cd33084d0f0e07

2.3.24 MarketPriceObserved

This entity contains a harmonised description of a generic commodity, crop or product price that varies over time (a spot price). This entity is primarily associated with the agricultural vertical and related IoT applications.

<MarketPriceObserved><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	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	Must be equal to "**`MarketPriceObserved`**".	M	N
dateCreated	DateTime	Entity creation timestamp. This will usually be allocated by the storage platform.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity. This will usually be allocated by the storage platform. A null value in this field or a value equivalent to dateCreated means the entity has not been modified since being created.	O	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.	R	Y
dataProvider	Text	A sequence of characters identifying the provider of the harmonised data entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<MarketPriceObserved><EntitySpecificAttributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null

refEntityInstance	Reference	A reference to the unique id of the Entity to which this record relates.	M	N
priceObserved	PStructuredValue	The market price observed represented using schema.org PriceSpecification attributes http://schema.org/PriceSpecification	M	N
address	PostalAddress	The market location encoded as a Schema.org PostalAddress. https://schema.org/PostalAddress	M	N
marketScale	TStructuredValue	Unique code assigned to market scale type. The content includes both a name and a value. "Wholesale":Wholesale market price "Retail":Retail market price for example (ex) {'name':'Wholesale', 'value':"02"} or {'name':'Retail', 'value':"01"}	M	N
priceAverage	PStructuredValue	The five year average market price observed represented using schema.org PriceSpecification attributes http://schema.org/PriceSpecification	O	Y
refWeatherObserved	Reference	A reference to the unique id of the related weather observed record.	O	Y

2.3.24.1 MarketPriceObserved JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/f4b694612a8d5c234632d1746865376c

2.3.25 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/ Recommended	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.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<PointOfInterest><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
location	geo:json	The geo:json encoded map location (point or polygon or multi-polygon), of this point of interest.	M	N
category	List	A JSON encoded List of one or more sequence of characters referring to category codes as per the taxonomy definition at https://github.com/Factual/places/blob/master/categories/factual_taxonom	M	Y

		y.json The respective locale specific category can be accessed via a lookup of the JSON dictionary.		
description	Text	An optional description of the entity.	R	Y
place	Place	The schema.org place definition for this Point Of Interest. See https://schema.org/Place	R	Y

2.3.25.1 PointOfInterest JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/4cd7203d66ccf2caf2123cf4519f5f74

2.3.26 Product

This entity contains a harmonised description of a generic product. This entity is primarily associated with products and supply chains. It is the harmonised description of the http://gs1.org/voc/Product:

<Product><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`Product`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<Product><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
productType	Reference	Unique id of this product type. Refers to the relevant ProductType record.	R	Y
supplierName	Text	The details of the local retailer of this product.	R	Y
category	List	A choice from an enumerated list. including: **`fertiliser, herbicide, pesticide, other`**	R	Y
gtin	Text	GS1 product code A Global Trade Item Number (GTIN)	O	Y

		is the 14 digit GS1 Identification Key used to identify products. The key comprises a GS1 Company Prefix followed by an Item Reference Number and a Check Digit. See http://www.gs1.org/gtin for more details. There are four GTIN formats. A uniform 14-digit format is required for this harmonised model, add leading zeros as required: 000000nnnnnnnn (GTIN-8) 00nnnnnnnnnnn (GTIN-12) 0nnnnnnnnnnnn (GTIN-13)		
productName	Text	The name of this product.	R	Y
description	Text	A description of this product.	R	Y
manufacturerName	Text	The name of manufacturer of this product.	R	Y
brand	Text	A description of this brand name.	R	Y
inPackageWidth	QuantitativeValue	The width of the product in the package, as measured according to the GS1 Package Measurement Rules. See http://www.gs1.org/package-measurement-rules-implementation-guide for more details.	O	Y
inPackageDepth	QuantitativeValue	The depth of the product in its packaging, as measured according to the GS1 Package Measurement Rules. See http://www.gs1.org/package-measurement-rules-implementation-guide for more details.	O	Y
inPackageHeight	QuantitativeValue	The height of the product in the package, as measured according to the GS1 Package Measurement Rules. See http://www.gs1.org/package-measurement-rules-implementation-guide for more details.	O	Y
netWeight	QuantitativeValue	Used to identify the net weight of the product. Net Weight excludes all packaging material, including the packaging material of all lower-level GTINs. Example:11.5 kg	O	Y
grossWeight	QuantitativeValue	Used to identify the gross weight of the product. The gross weight includes all packaging materials of the product. At pallet level the	O	Y

		productGrossWeight includes the weight of the pallet itself. For example, 200 GRM, value - total pounds, total grams, etc.		
countryOfOrigin	Text	Country where the product was manufactured, harvested, mined etc. Code indicating the country of origin of the product.	O	Y
gpcCategoryCode	Text	Product category code 8-digit code (GPC "Brick Value") specifying a product category according to the GS1 Global Product Classification (GPC) standard. For more information see http://www.gs1.org/gpc	O	Y
image	List of URLs	List of URLs of images of the product. Each URL links to a file containing a visual representation of the product either as catalogue images or as actual images of the specific product.	O	Y
growerURL	URL	URL of a grower of a product (particularly agricultural)	O	Y
manufacturer	Organization	Name of the product manufacturer The organization that produces the item.	O	Y

2.3.26.1 Product JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/0817901a9f8ae3440ab751513acdf88e

2.3.27 ProductRecord

This entity contains a harmonised description of the conditions recorded as a product (generally a physical instance of a product) moves through the supply chain. This entity is primarily associated with the retail supply vertical and related IoT applications.

<ProductRecord><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`ProductRecord`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<ProductRecord><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
refProduct	Reference	Unique id of the Product to which this record relates.	M	N
location	geo:json	The geo:json encoded current location.	M	N
temperature	ExtQuantitativeValue	The observed local air temperature in degrees centigrade encoded as an ExtQuantitativeValue.	O	Y
relativeHumidity	ExtQuantitativeValue	Relative Humidity a number between 0 and 1 representing the range 0% to 100 (%)	O	Y

		0 ⩽ relativeHumidity ⩽ 1 encoded as a ExtQuantitativeValue.		
atmosphericPressure	ExtQuantitativeValue	Atmospheric Pressure in units of hecto Pascals encoded as a ExtQuantitativeValue.	O	Y
description	Text	Description of this ProductRecord.	R	Y
weight	ExtQuantitativeValue	Current (i.e. measured) weight of the product including packaging. This may differ from the original weight due to additional packaging or losses during shipment e.g. evaporation	O	Y
netWeight	QuantitativeValue	Weight of the Agri-Product itself in a package with GS1 code Used to identify the net weight of the product. Net Weight excludes all packaging material, including the packaging material of all lower-level GTINs. Example:11.5 kg	O	Y
volume	QuantitativeValue	The current volume of the product including packaging.	O	Y
dateObserved	DateTime	The timestamp at which this ProductRecord was generated.	R	Y
O2	QuantitativeValue	The level of gaseous Oxygen (O2) present in the atmosphere as measured around the product. (M1)	O	Y

2.3.27.1 ProductRecord JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/4c2fc701cf2bf121b360613cf27ba8d4

2.3.28 ProductType

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

<ProductType><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`ProductType`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<ProductType><Entity Specific Attributes>

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

2.3.28.1 ProductType JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/1cc0398be95ed4287dec068f8bc6da50

2.3.29 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/ Recommended	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.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<Road><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
country	Text	The country in which this road is in	M	N
refRoadSegment	List of Reference	A JSON encode sequence of characters referencing the unique ids of the group of roadSegments that define this road.	R	Y
roadClass	Text	The official classification of this road (relevant to the local country).	R	Y
name	Text	The official designation of this road.	R	Y
alternateName	Text	An alternative name for this road.	O	Y

2.3.29.1 Road JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/aa8dc76b8702be6e0f9509563c308861

2.3.30 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/ Recommended	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.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<RoadSegment><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	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.	R	Y
name	Text	The official designation of the road that this roadSegment is a part of.	R	Y
location	geo:json	A geo:json line sequence (LineString)	R	Y

		containing all the points that make up this RoadSegment.		
refPointOfInterest	List of Reference	A List containing a JSON encoded sequence of characters referencing the Ids of the points of interest along this road segment.	O	Y

2.3.30.1 RoadSegment JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/127ce8f2f2b56e50d9326523fc1a221f

2.3.31 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/ Recommended	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.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<Subscriber><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
subscriptionId	Reference	A reference to the unique id of the subscription service.	M	N
startDate	DateTime	The start timestamp for this subscription as an ISO8601 sequence of characters in UTC.	R	Y
endDate	DateTime	The end timestamp for this subscription as an ISO8601 sequence of characters in UTC.	R	Y
duration	Number	The duration of the subscription in calendar months.	O	Y

category	List	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 or QuantitativeValue	Average monthly usage of the subscription service.	O	Y
subscribed	List of Reference	A List 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

2.3.31.1 Subscriber JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/4bdc07091dd7fd8af7abcb58103ba513

2.3.32 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/ Recommended	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.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<SubscriptionService><Entity Specific Attributes>

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

2.3.32.1 SubscriptionService JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/08c9d422617b832bc1c04d164973c172

2.3.33 UAV

This entity contains a harmonised description of a specific Unmanned Aerial Vehicle (UAV). This entity is primarily associated with UAV command and control and related UAV transport applications.

<UAV><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	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	Must be equal to "**UAV**".	M	N
dateCreated	DateTime	Entity creation timestamp. This will usually be allocated by the storage platform.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity. This will usually be allocated by the storage platform. A null value in this field or a value equivalent to dateCreated means the entity has not been modified since being created.	O	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.	R	Y
dataProvider	Text	A sequence of characters identifying the provider of the harmonised data entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<UAV><EntitySpecificAttributes>

Attribute Name	Attribute	Description	Mandatory/ Optional/	May be

	Type		Recommended	Null
refUAVModel	Reference	A JSON encode sequence of characters referencing the Id of the UAVModel entity, which describes this UAV in more detail.	M	N
owner	List of references to Person(s) or Organization(s)	A List 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	R	Y
operator	List of references to Person(s) or Organization(s)	A List 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	R	Y
operationMode	Text	Text describing the choice from "vlos", "evlos", "bvlos", "automated" Note: descriptions align with UTM Flight message.	R	Y
location	Geo:json	The current geo:json encoded map location of the UAV	M	N
elevation	ExtQuantitativeValue	The elevation of the UAV. Specify value and units of measure	M	N
dateObserved	DateTime	The date and time of this monitoring report in ISO8601 UTC format.	M	N
flightStatus	Text	The flight status of the UAV, including stop, takeoff, flight, hover, land	M	N
workStatus	Text	The work status of the UAV, including stop, prepare, work, finish	O	Y
groundSpeed	ExtQuantitativeValue	The real-time speed of the UAV. Specify value and units of measure	O	Y
fuel	ExtQuantitativeValue	Current fuel load of the UAV. Specify value and units of measure	O	Y

2.3.33.1 UAV JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/c4797bcbb68497feee3769df50ce12e0

2.3.34 UAVADSB

This entity contains a harmonised description of a generic UAV Automatic Dependent Surveillance–Broadcast. This entity is primarily associated with the control and management of Unmanned Aerial Vehicles. Each UAVADSB instance will be related to a specific UAV instance.

<UAVADSB><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**UAVADSB**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

< UAVADSB><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
refUAV	Reference	Refers to the specific UAV instance to which this **UAVADSB** record relates.	M	N
dateObserved	Date Time	The date and time of this DBS broadcast in ISO8601 UTC format.	M	N
originator	Boolean	A logical indicator of source of the message. TRUE indicates it is the UAV itself, FALSE indicates that it is a different source, a listening station software application or a different UAV.	M	N
refOriginator	Reference	Refers to the specific UAV instance or software application that reported the information.	O	Y
UAVADSBroadcast	Text	A flight message describing the current flight status encoded as a DBSB Message in a string encoded binary format. https://media.readthedocs.org/pdf/adsb-decode-guide/latest/adsb-decode-guide.pdf	M	N

2.3.34.1 UAVADSB JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/3c326f6fe66b3eeab2b1464c28563dca

2.3.35 UAVEvent

The UAVEvent records the incursion of a specific UAV into or near protected airspace or locations. It also records the control measure taken. This entity is primarily associated with UAV command and control and related UAV transport applications.

<UAVEvent><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
Id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`UAVEvent`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<UAVEvent><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
refUAV	Reference	A JSON encode sequence of characters referencing the Id of the UAV entity, which is associated with this event.	M	N
refOriginator	Reference	Refers to the specific software application that reported the information.	M	N
location	Geo:json	The geo:json encoded map location of the UAV point where the event is triggered.	M	N
elevation	ExtQuantitativeValue	A number indicating the elevation of the UAV when the event is triggered. Specify value and units of measure	M	N
eventStart	DateTime	The start date and time of this event in ISO8601 UTC format.	M	N
eventType	Text	The type of the UAV event, a choice from: illegal flight , close to unpermitted airspace, overspeed, over height, illegal work	M	N
description	Text	The description of this event	R	Y
eventEnd	DateTime	The end date and time of this event in ISO8601 UTC format.	R	Y
eventResult	Text	The handle result of the event, a choice from: logged, notify, alarm, force land, force back, force hover	R	Y

2.3.35.1 UAVEvent JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/050f4f160371a087845e17214904f3e8

2.3.36 UAVModel

This entity contains a harmonised description of a generic Unmanned Ariel Vehicle (UAV) model and is applicable to UAV command and control and related UAV transport applications.

<UAVModel><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	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	Must be equal to "**`UAVModel`**".	M	N
dateCreated	DateTime	Entity creation timestamp. This will usually be allocated by the storage platform.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity. This will usually be allocated by the storage platform. A null value in this field or a value equivalent to dateCreated means the entity has not been modified since being created.	O	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.	R	Y
dataProvider	Text	A sequence of characters identifying the provider of the harmonised data entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<UAVModel><EntitySpecificAttributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
model	Text	The UAV model's identifier, which may be a UAVModel name.	M	N

doc	URL	Reference to Product Data Sheet or other manufacturer's documentation about this UAVModel.	R	Y
description	Text	A description of this UAVModel.	R	Y
manufacturerName	Text	The name of manufacturer of this UAVModel.	R	Y
brandName	Text	A description of the brand name of this UAVModel.	R	Y
category	Text	The work category of the UAVModel A choice from the following list: "Aerial_photography, Plant_protection, Industry, Routing_inspection, Mailing, Transportation"	R	Y
rotorNumber	Number	The number of the rotors of the UAVModel	R	Y
fuelType	Text	The fuel type powering the UAVModel. 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	R	Y
maxFlightTime	QuantitativeValue	The maximum duration of flight of the UAVModel with full fuel and no load. Specify value and units of measure	R	Y
maxFlightAltitude	QuantitativeValue	The maximum flight altitude of the UAVModel above ground. Specify value and units of measure	R	Y
maxGroundVelocity	QuantitativeValue	The maximum ground velocity of the UAVModel. Specify value and units of measure	R	Y
minWeight	QuantitativeValue	The weight of the UAV without fuel or load. Specify value and units of measure	O	Y
minUnladenWeight	QuantitativeValue	The weight of the UAV with full fuel but no load. Specify value and units of measure	O	Y
maxLoad	QuantitativeValue	The maximum load that the UAV is permitted to transport. Specify value and units of measure.	O	Y

2.3.36.1 UAVModel JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/ef967e9b0f6837603af191f69b975ae7

2.3.37 UAVStateVector

This entity contains a harmonised description of a generic UAV State Vector, which is an Interpretation and aggregation of Automatic Dependent Surveillance–Broadcast messages. This entity is primarily associated with the control and management of Unmanned Aerial Vehicles. Each UAVStateVector instance is related to a specific UAV instance.

< UAVStateVector ><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`UAVStateVector`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

< UAVStateVector ><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
refUAV	Reference	Refers to the specific UAV instance to which this UAVstateVector record relates.	M	N
dateObserved	DateTime	The date and time relating to this state vector in ISO8601 UTC format.	M	N
refOriginator	Reference	Refers to the specific software application that reported the	M	N

		information.		
stateVector	List	A state vector describing the current flight status encoded as an opensky-network.org StateVector encoded as a JSON object. https://opensky-network.org/apidoc/javadoc/org/opensky/model/StateVector.html	M	N

2.3.37.1 UAVStateVector JSON

The JSON code can be downloaded from:
https://gist.github.com/GSMADeveloper/0ef3d716a8303580f4fec17ca32d8af0

2.3.38 UAVTMS

This entity contains a harmonised description of a specific Unmanned Aerial Vehicle (UAV) Traffic Management Software Application that is designed to listen to and monitor the information transmitted by UAV's, typically this software application would be operated at a ground station. This entity is primarily associated with UAV command and control applications.

<UAVTMS><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	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	Must be equal to **"UAVTMS".**	M	N
dateCreated	DateTime	Entity creation timestamp. This will usually be allocated by the storage platform.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity. This will usually be allocated by the storage platform. A null value in this field or a value equivalent to dateCreated means the entity has not been modified since being created.	O	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.	R	Y
dataProvider	Text	A sequence of characters identifying the provider of the harmonised data entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<UAVTMS><EntitySpecificAttributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/	May be Null

			Recommended	
refSoftwareApplication	Reference	A JSON encoded sequence of characters referencing the unique Id of the Software Application. Related to a Schema.org Software Application. https://schema.org/SoftwareApplication	M	N
operationalInstance	URL	A sequence of characters giving the URL of this operational instance.	M	N
owner	List of references to Person(s) or Organization(s)	A List 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	R	Y
operator	List of references to Person(s) or Organization(s)	A List 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	R	Y

2.3.38.1 UAVTMS JSON

The JSON code can be downloaded from:
https://gist.github.com/GSMADeveloper/cfc36fd28d8b38313eccedd3bc6b00c1

2.3.39 UAVUTMFlightMessage

This entity contains a harmonised description of a generic UAV UTM Flight Message, which contains a Global UTM Association protocol message. This entity is primarily associated with the control and management of Unmanned Aerial Vehicles. Each UAVUTMFlightMessage instance is related to a specific UAV instance.

< UAVUTMFlightMessage ><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`UAVUTMFlightMessage`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

< UAVUTMFlightMessage ><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
refUAV	Reference	Refers to the specific UAV instance to which this UAVFlightMessage record relates.	M	N
dateObserved	DateTime	The date and time relating to this UTM flight message in ISO8601 UTC format.	M	N
originator	Boolean	A logical indicator of source of the	M	N

		message. TRUE indicates it is the UAV itself, FALSE indicates that it is a different source, a ground station software application.		
refOriginator	Reference	Refers to the specific software application that reported the information.	O	Y
flightMessage	StructuredValue	A flight message describing the current flight status encoded as a Global UTM Message encoded as a JSON object. https://bitbucket.org/global_utm/flight-declaration-protocol/	M	N

2.3.39.1 UAVUTMFlightMessage JSON

The JSON code can be downloaded from:
https://gist.github.com/GSMADeveloper/03cb32dc73e933bec1ced78abc312472

2.3.40 UAVUTMFlightMessageAgent

This entity contains a harmonised description of a generic UAV UTM Flight Message Agent that is designed to subscribe to the Global UTM Association protocol message according to a specific UAV entity. This entity supports the functionality of a service provider to confirm the validity of UTM Flight Message generated by UTM Flight Message Entity. The service provider can include their own Flight Control Policy to the original UTM Flight Message and forward this to a UAVTMS entity.

< UAVUTMFlightMessageAgent ><Generic Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
id	Text	Unique id of this instance of this entity.	M	N
type	Text	Must be equal to "**`UAVUTMFlightMessageAgent`**".	M	N
dateCreated	DateTime	Entity creation timestamp.	M	N
dateModified	DateTime	Timestamp of the last modification of the entity.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

< UAVUTMFlightMessageAgent ><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
refUAV	Reference	Refers to the specific UAV instance to which this UAVFlightMessage record relates.	M	N
dateObserved	DateTime	The date and time relating to this UTM flight message in ISO8601 UTC	M	N

		format.		
originator	Boolean	A logical indicator of source of the message. TRUE indicates it is the UAV itself, FALSE indicates that it is a different source, a ground station software application.	M	N
refOriginator	Reference	Refers to the specific software application that reported the information.	O	Y
flightMessage	StructuredValue	A flight message describing the current flight status encoded as a Global UTM Message encoded as a JSON object. https://bitbucket.org/global_utm/flight-declaration-protocol/	M	N
validationResult	Boolean	A logical indicator of validation of the message. TRUE indicates it is the validation is confirmed, FALSE indicates that the validation confirmation fails.	M	N
flightControlPolicy	Text or URL	Indicates the flight control policy generated by the service provider. It could be JSON or XML format.	R	Y

2.3.40.1 UAVUTMFlightMessageAgent JSON

The JSON code can be downloaded from:
https://gist.github.com/GSMADeveloper/842fda37cc62b63b55ecd24bf20eed60

2.3.41 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/ Recommended	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.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<Vehicle><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
refVehicleType	Reference	A JSON encoded 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,`**	O	Y

		diesel, electric, hydrogen, lpg autogas, cng, biodiesel, ethanol, hybrid electric/petrol, hybrid electric/diesel, other		
displacement	Number	A number indicating the cylinder capacity of the engine in litres	O	Y
fuelEfficiency	QuantitativeValue	The efficiency of the vehicle expressed as kilometres per litre or miles per gallon following the Schema.org definition at http://schema.org/fuelEfficiency	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
vehicleIdentificationNumber	Text	The VIN (vehicle identification number) of the vehicle.	O	Y
mileageFromOdometer	Number or ExtQuantitativeValue	The total distance the car has travelled according to the on-board odometer in kilometres (unitCode KMT) or miles (unitCode SMI). If Number is used the units are assumed to be kilometres. references Schema.org Vehicle/ mileageFromOdometer.	O	Y

2.3.41.1 Vehicle JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/0e22f3200c12c9e725148eafca6b225c

2.3.42 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/ Recommended	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.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<VehicleFault><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
refVehicle	List of Reference	A JSON encoded sequence of characters referencing the id of the vehicle in which this fault occurred or multiple ids in the case a common fault can be identified against multiple vehicles.	M	N
dateIdentified	DateTime	An ISO8601 sequence of characters indicating the date and time the fault was detected or identified.	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.	R	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.	R	Y
faultLog	Text	Free text that records information about the initial fault incident, ongoing updates and fault resolution.	O	Y

2.3.42.1 VehicleFault JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/9a70cc18bd403c7115d0ffec8ecc2ecf

2.3.43 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/ Recommended	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.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<VehicleType><Entity Specific Attributes>

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

2.3.43.1 VehicleType JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/50133c6710743c065dc5f2f982b698fd

2.3.44 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/ Recommended	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.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<WaterQualityObserved><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
refDevice	List 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
depth	ExtQuantita	Depth where the observation was	O	Y

	tiveValue (Number)	taken. (*m*) encoded as a ExtQuantitativeValue.		
pressure	ExtQuantitativeValue (Number)	Hydrostatic pressure where the observation was taken. (Hector Pascals) 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
Chla	ExtQuantitativeValue (Number)	Concentration of chlorophyll A. (H29)	O	Y
Cl	ExtQuantitativeValue (Number)	Concentration of chlorides. (M1)	O	Y
CO	ExtQuantitativeValue (Number)	The level of free non-compound carbon monoxide present. (M1)	O	Y
CO2	ExtQuantita	The level of free non-compound	O	Y

	tiveValue (Number)	carbon dioxide present. (M1)		
Hg	ExtQuantitativeValue (Number)	The level of compound mercury present. (M1)	O	Y
NH3	ExtQuantitativeValue (Number)	Concentration -n of ammonia. (M1)	O	Y
NH4	ExtQuantitativeValue (Number)	Concentration of ammonium. (M1)	O	Y
NO3	ExtQuantitativeValue (Number)	Concentration of nitrates. (M1)	O	Y
O2	ExtQuantitativeValue (Number)	The level of free non-compound oxygen present. (M1)	O	Y
PC	ExtQuantitativeValue (Number)	Concentration of pigment phycocyanin which can be measured to estimate cyanobacteria concentrations specifically. (H29)	O	Y
PE	ExtQuantitativeValue (Number)	Concentration of pigment phycoerythrin which can be measured to estimate cyanobacteria concentrations specifically.(H29)	O	Y

2.3.44.1 WaterQualityObserved JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/e23befb590592ddefa6fd817d38919f0

2.3.45 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/ Recommended	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.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<WeatherForecast><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	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.**	R	Y
visibility	Number or QuantitativeValue	Defines the forecast visibility nominally in metres or in an alternative measurement according to specified unitCode if QuantitativeValue is used	R	Y
name	Text	The name of the weather forecast location.	M	Y
validFrom	DateTime	The date and time the forecast is valid from expressed as an ISO8601 UTC format sequence of characters.	R	Y
validThrough	DateTime	The date and time the forecast is valid to expressed as an ISO8601 UTC format sequence of characters.	R	Y
dayMinimum	StructuredValue	Defines the minimum forecast values for defined attributes. Supports the inclusion of the nested attribute values, each of which will be a number. The units of the respective values will match the respective main attributes for temperature/ relative humidity. **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 representing the range 0% to 100%	O	Y
dayMaximum	StructuredValue	Defines the maximum forecast values for defined attributes.	O	Y

		Supports the inclusion of the nested attribute values, each of which will be a number. The units of the respective values will match the respective main attributes for temperature/ relative humidity. **`temperature, feelsLikeTemperature, relativeHumidity`** **`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 representing the range 0% to 100%		
address	PostalAddress	The weather forecast location encoded as a Schema.org PostalAddress. https://schema.org/PostalAddress	R	Y
temperature	Number or ExtQuantitativeValue	The temperature expressed in degrees Celsius.	R	Y
windDirection	Number or ExtQuantitativeValue	The wind direction expressed in degrees compared to geographic North (measured clockwise).	O	Y
windSpeed	Number or ExtQuantitativeValue	The forecasted wind speed in meters per second.	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 or ExtQuantitativeValue	The relative humidity expressed a number between 0 ≤ RelativeHumidity ≤ 1 representing the range 0% to 100%	O	Y
precipitationProbability	Number or ExtQuantitativeValue	The probability of precipitation, expressed as a number between 0 ≤ precipitationProbability ≤ 1 representing the range 0% to 100%	O	Y
refPointOfInterest	List of Reference	A JSON encode sequence of characters referencing the unique ids of the associated group of pointOfInterests.	O	Y

2.3.45.1 WeatherForecast JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/fe74d7f9573c53bc46b5199d2ab9c847

2.3.46 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/ Recommended	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.	O	Y
source	Text	A sequence of characters giving the source of the entity data as a URL.	R	Y
dataProvider	Text	A sequence of characters identifying the originator of the harmonised entity.	R	Y
schemaVersion	Text or URL	Indicates the version number of the data entity via either a URL referring to an external entity version (e.g. http://schema.org/version/2.0/) or a sequence of text characters of the form "M.N" where M is a sequence of digits representing the major version number and N is a sequence of digits representing a minor version number. If omitted implies a schema version of "1.0"	R	Y

<Weather Observed><Entity Specific Attributes>

Attribute Name	Attribute Type	Description	Mandatory/ Optional/ Recommended	May be Null
location	geo:json	The geo:json encoded map location (point or polygon), of this weather observation.	M	N
refDevice	List 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, heavyRainShower, heavyRain, sleetShower, sleet, hailShower, hail, lightSnow Shower, lightSnow, heavySnowShower, heavySnow, thunderShower, thunder**	R	Y
visibility	Number or Quantitativ eValue	Defines the observed visibility nominally in metres or in an alternative measurement according to specified unitCode if QuantitativeValue is used	R	Y
name	Text	The name of the weather observation location.	R	Y
address	PostalAdre sss	The weather observed location encoded as a Schema.org Postal Address. https://schema.org/PostalAddress	R	Y
temperature	Number or ExtQuantita tiveValue	The recorded temperature expressed in degrees Celsius, encoded as a Number OR a ExtQuantitativeValue.	R	Y
refPointOfInterest	List of Reference	A JSON encode sequence of characters referencing the unique ids of the associated group of pointOfInterests.	O	Y
windDirection	Number or ExtQuantita tiveValue	The wind direction expressed in degrees compared to geographic North (measured clockwise), encoded as a Number OR a ExtQuantitativeValue.	R	Y
windSpeed	Number or ExtQuantita tiveValue	The observed wind speed in meters per second, encoded as a Number OR a ExtQuantitativeValue.	R	Y
relativeHumidity	Number or ExtQuantita tiveValue	The relative humidity expressed a number between 0 ≤ RelativeHumidity ≤ 1 representing the range 0% to 100%, encoded as a Number OR a ExtQuantitativeValue.	R	Y
dewPoint	Number Or ExtQuantita tiveValue	The dew point in degrees Celsius, encoded as a Number OR a ExtQuantitativeValue.	O	Y

atmosphericPressure	Number Or ExtQuantitativeValue	The measured barometric or atmospheric pressure in units of hecto Pascals, encoded as a Number OR a ExtQuantitativeValue.	R	Y
pressureTendency	Text Or ExtQuantitativeValue	Is the pressure is rising or falling? Encoded as Text OR a ExtQuantitativeValue. A choice from an enumerated list. One of: **`rising, falling, steady`**.	R	Y
rainfallRate	ExtQuantitativeValue	The observed rainfall rate in mm per hour encoded as an ExtQuantitativeValue.	R	Y
rainfall	ExtQuantitativeValue	The accumulated rainfall as observed at this stationEncoded as an ExtQuantitativeValue.	R	Y
evapotranspiration	ExtQuantitativeValue	Encoded as an ExtQuantitativeValue. Defined as the sum of evaporation and plant transpiration from the Earth's land and ocean surface to the atmosphere.	R	Y
referenceEvapotranspiration	ExtQuantitativeValue	Encoded as an ExtQuantitativeValue. Defined as the environmental demand for evapotranspiration and represents the evapotranspiration rate of a short green crop (grass), completely shading the ground, of uniform height and with adequate water status in the soil profile	R	Y

2.3.46.1 WeatherObserved JSON

The JSON code can be downloaded from:

https://gist.github.com/GSMADeveloper/f592f7923c97cd5c6d18bc44a42b7050

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 via a GIT HUB link below. This information is informative only.

The Annex B information is available via this link:
https://github.com/GSMADeveloper/EntityDefinitions-master/blob/master/AnnexB%20Referenced%20Schema.md

Annex C Referenced entities (Informative)

Some members of the project group have reported difficulties in accessing UAV data definitions. To provide additional clarity we provide a snapshot of the relevant entity definitions via a GIT HUB link below. This information is informative only.

The Annex C information is available via this link:

https://github.com/GSMADeveloper/EntityDefinitions-master/blob/master/AnnexC%20Referenced%20UAV%20entity%20definitions.md

Annex D Document Management

a. Document History

Version	Date	Brief Description of Change	Approval Authority	Editor / Company
0.10	8 Sept 2016	New PRD - first draft	PSMC	Allan Bartlett / GSMA
1.0	11 Oct 2016	Approved first version	PSMC	Allan Bartlett / GSMA
2.0	21 June 2017	Updated PRD with the following improved definitions: 1. Mandatory Null Values removed (Generic issue) changed to three possible combinations (section 2.3): I. "Mandatory / May not be Null" – attribute must always be specified and with a non Null value; II. "Recommended / May be Null" – attribute should always be specified but may have a Null value or may default to a defined value if omitted; III. "Optional / May be Null" – attribute may be specified but may have a Null value or may default to a defined value if omitted. 2. 'EnvironmentObserved' entity 2.3.16 has 'Measurand' attribute removed due to ambiguous usage. 3. 'Machine' entity 2.3.17 has 'factory' attribute added. 4. 'Product' entity 2.3.21 allowed only one supplierName to be listed (Specific to 'Product' entity) so changed to supplier or the URL to the supplier of the product or to a list of suppliers for the product. The URL can point to either a web page for one or more suppliers or a JSON based list of suppliers structured using the Schema.org defined 'Organisation'URL 5. 'ProductRecord' entity 2.3.22 (Specific issue to 'ProductRecord') enhanced e.g. O2 attribute 6. 'Vehicle' entity 2.3.28 references multiple 'VehicleType's (Specific to 'Vehicle' entity) so changed the definition of the 'refVehicleType' attribute to a single value rather than a list of values. 7. 'Vehicle' entity 2.3.28 updated with 'fuelEconomy' attribute adopted to use the Schema.org definition of 'fuelEfficiency' which is based on 'QuantitativeValue'. 8. 'WaterQualityObserved' 2.3.31 - removed 'measurand' (Generic issue with 'measurand'). Measurand removed from this and all other entity definitions. 9. 'WeatherForecast' 2.3.32 attribute 'visibility' lacked agreement on definition	Project Approval	Allan Bartlett / GSMA

		(Specific issue to 'WeatherForecast') so revised to type 'ExtQuantitativeValue' and normally recorded in metres (though with the option to use 'statute miles' provided the relevant unitCode is used within 'ExtQuantitativeValue') 10. 'WeatherForecast' 2.3.32 validity period was not queryable using NGSIv2 (Generic issue for validity periods) so revised the 'validity' attribute to separate 'validFrom' and 'validTo' attributes. 11. 'WeatherForecast' 2.3.32 'dayMinimum' & 'dayMaximum' attributes was not queryable using NGSIv2 (Generic issue relating to 'Array of text') so have been revised. GSMA logo updated on page 1 Typo on page 11 of Whcere corrected to Where		
3.0	24 Oct 2017	Updated entities: 2.3.17 machine 2.3.19 machineOperation New entities: 2.3.20 MarketPriceForecast 2.3.21 MarketPriceObserved Annex B6 schema.org/PriceSpecification	Project Approval	Allan Bartlett / GSMA
4.0	22 Dec 2017	Updated entities: 2.3.9 AirQualityObserved New entities 2.3.30 UAV 2.3.31 UAVADSB 2.3.32 UAVEvent 2.3.33 UAVModel 2.3.34 UAVStateVector 2.3.35 UAVTMS 2.3.36 UAVUTMFlightMessage 2.3.37 UAVUTMFlightMessageAgent Annex B7 schema.org/SoftwareApplication Annex C UAV entity definitions	Project Approval	Allan Bartlett / GSMA
5.0	31 Jan 2018	Updated entities: 2.3.46 WeatherObserved JSON examples removed from all entities GIT HUB references remain. New entities 2.3.17 FleetVehicle 2.3.18 FleetVehicleOperation 2.3.19 FleetVehicleStatus Annex B Moved to GIT HUB, reference included Annex C Moved to GIT HUB, reference included	Project Approval	Allan Bartlett / GSMA

b. Other Information

Type	Description
Document Owner	Internet of Things– IoT Big Data Project

Editor / Company	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.