SmartSpace®

Web Source Injector Users' Guide for AVL/GPS Connect

Introduced in version 3.2 and deprecated from version 3.9

Contents

Web Source Injector

This guide describes the Web Source Injector service for the AVL/GPS connect feature introduced in SmartSpace version 3.2.
Web Source Injector will be deprecated from version 3.9 and its functions completely replaced by the External data connector.
The instructions provided here are intended only for existing installations that use Web Source Injector; all installations requiring new instances of connecting web sources to the Ubisense platform should use the External data connector.

Introduction to Web Source Injector

The web source injector is a service that periodically sends requests to **web sources**[1] or location information and injects these locations into the Ubisense location platform. The service supports a range of formats and has various features that need to be configured prior to use. This process is covered in detail in this document.

Ubisense AVL/GPS connect is available for Microsoft® Windows®.

[1]A URL or SQL database that responses to web requests with location data

Supported formats

The web source injector supports response **messages**[1] in JSON, XML, CSV or SQL formats.

JSON

JSON messages can be either a JSON object or array containing one or more **location objects**[2]. Each location object should be a JSON object containing members, named value/array pairs, for the **data fields**[3]. You can configure which name/array index corresponds to which data field in service parameters. (See *Data field labels*). The location objects can be the top level object/array or nested within other JSON objects and each data field within those objects can be further nested or contained within an array at a fixed index.

XML

XML messages can be either a single location object element or set of location object elements. Each location object should be an element consisting of data fields as attributes or child elements in the form <Tag>value</tag>, you can configure which attribute names/tags correspond to which data field in service parameters (see *Data field labels*). The location objects can be contained within the root element (or be the root element itself when in single object mode), or be contained within some XML element at a greater depth. Each data field within those objects can also be an indirect descendant or, when several elements at the same level have the same name, can be identified fixed index.

CSV

CSV messages should be a rows of location objects where each row is separated by a new line and each column is separated by some configurable delimiter. The CSV should start with a row of column headings. You can define which column (in terms of heading) corresponds to which data field in service parameters. (See *Data field labels*).

[1]A response from a web source that contains location data
[2]Data for an individual location as found in location messages
[3]A single data entry used in generating locations e.g. the x coordinate of the location

SQL

SQL queries should return rows of location objects. You can define which column (in terms of names) corresponds to which data field in service parameters. (See *Data field labels*).

Configuration Parameters for Web Source Injector

The service is configured within SmartSpace Config by creating configuration objects in the Types and objects workspace and then applying parameters to them using the Service parameters workspace.

Web source parameters

Create a Web Location Source object for each source in the Types and objects workspace. Then configure its parameters in the Service parameters workspace by choosing **GPS and web location sources** and **Web Location Source** and then dragging the object you created into the object browser. The parameters you can configure are described in the following sections.

For an example of configuring a web source, see *Web Source Injector Example*.

Connection parameters

Parameter	Description
enabled	A web source must be enabled to be used.
source address	The URL of the web source. For SQL sources this is the connection string.
source format	The format type, i.e. XML, JSON, CSV or SQL
update interval	The time to wait between sending requests to the web source.
root element path	For XML or JSON sources. The path to the XML element/JSON object where the locations objects are contained, defined using the field path syntax outlined in *Field Path Syntax*. The top level element/object is assumed if this is not set.

Parameter	Description
single object mode	Whether the element/object pointed to is a single locations object or a set/array of them. Only relevant for XML and JSON sources.
DMS format GPS	When true, latitude/longitude fields in the source data are assumed to be in degrees, minutes, seconds format (as ddmmss.s). Otherwise decimal degrees format is assumed.
CSV separator	The delimiter between fields, for CSV format sources.
SQL query	The query to execute, for SQL format sources.

Data field labels

The following parameters define what data fields are in your source data. Any non-empty field label will be looked for in the source data. A location object must contain all labeled fields else it will be skipped. Define x, y and z for a Cartesian web source or define latitude, longitude and (optionally) altitude for a GPS web source.

All field name parameters support the field path syntax, outlined in *Field Path Syntax*, for JSON or XML sources.

Parameter	Description
field name - X	The X location field label.
field name - Y	The Y location field label.
field name - Z	The Z location field label.
field name - latitude	The latitude field label.
field name - longitude	The longitude field label.

Parameter	Description
field name - altitude	The altitude field label. If absent, default altitude is used for GPS locations.
field name - datetime	The datetime field label. If absent, current time of the service is used on injection.
field name - jitter	The jitter field label. This data field is used to reset the median filter where a value of "1" signifies a reset and "0" otherwise.
field name - object name	The object name field label. Locations will be injected for objects with these names or tags with those IDs depending on the object/tag configuration.
field name - object type	The object type field label. Used with object field name to determine what object to assign the location to, the type name should be in UDM format. Use when using dynamic object injection, covered in the next section, when the data is for more than one type of object. Use object type name instead when all objects are of a single type.
field name - filter	The label for the filter field. When defined, this field's value is checked against the filter value. If the values do not match the location object is ignored.
filter value	The filter value to use with field name - filter.

Object/tag parameters

These parameters are used to configure how the service determines which Ubisense object each location object is for. The service supports several modes for object/tag assignment:

1. fixed tag injection, where all location objects are injected with a predefined, fixed Ubisense tag;
2. dynamic tag injection, where tag IDs are parsed from the object name field and locations are injected for those tags;
3. dynamic object injection, where the object the location is for is determined using the object name field and locations are injected for those objects/the tags they are associated with;
4. dynamic object injection with tag assignment, where the object is determined for the object name field and a tag is automatically assigned to the object if required. Also allows for automatically creating the object if it does not already exist.

Parameter	Description	Modes
fixed tag id	All locations are injected for this tag id.	1
tag id mask	64-bit mask to be bitwise OR-ed with tag IDs read from the source.	2
object type name	The UDM type name of the object type. Use this or object type field name, together with object name field name to use dynamic object injection.	3,4
create missing objects	When set, if no platform objects match the name/type of the location object, a new platform objects will be created with this name. This option is only supported when the object name property is unset. Note: locations will not be injected when the object is first created, it will have to wait for a subsequent location for that object.	4
tag range minimum id	The minimum tag id to automatically assign to an object.	4
tag range maximum id	The maximum tag id to automatically assign to an object.	4
enforce tag range	When true, objects already associated with tags outside the dynamic range will be assigned new tags within the range, when locations are injected for those objects.	4

Transformation parameters

The service includes several parameters for transforming coordinates if your source coordinate system is different from the Ubisense platform coordinate system.

Parameter Name	Description
transform offset x	The offset to add to the x coordinate after applying the rotation.
transform offset y	The offset to add to the y coordinate after applying the rotation.
transform offset z	The offset to add to the z coordinate after applying the rotation.
transform yaw	The rotation, in degrees, about the z axis (i.e. of the xy plane) to rotate locations by. This is the same as the angle from the x axis of the Ubisense coordinate system to the source coordinate system.
transform pitch	The rotation, in degrees, about the y axis (i.e. of the xz plane) to rotate locations by.
transform roll	The rotation, in degrees, about the x axis (i.e. of the yz plane) to rotate locations by.
transform left handed	Set to true when the source coordinate system uses left handed axis i.e. the y coordinate needs to be negated to match the Ubisense coordinate system.

Filtering and miscellaneous parameters

The Web Source Injector has support for applying median filtering to your locations. Median filtering will smooth the injected locations by storing a history of locations for each tag, local to that web source. A median of the recent locations is stored and the injected location will be the mean of the recent median locations. If your data supports it, you can also configure a jitter reset as outlined above in *Data field labels*.

Parameter	Description
location GDOP	The geometric dilution of precision of the locations injected by this source.
location standard error	The standard error of the locations injected by this source.
use median filter	Whether to use the median filter. Filter setting are configured in the global parameters.
arbitration time	Locations will not be injected if the platform has seen the tag within this time (seconds).

Global Parameters

In addition to the web source parameters, there are parameters that apply to all sources the service is running. Choose **GPS and web location sources** and **Location Cell** to view these parameters (the service runs at the location cell level). When setting these parameters it is recommended that you set them to the same value for all location cells using the **<All objects of type Location Cell>** option.

Parameter Name	Description
Date format	The format of DateTime fields in messages. The service can parse ISO 8601 conforming formats automatically without needing to set this.
Default altitude	The altitude to use for GPS locations when one is not specified in the data fields.
Inject with current time	When true, locations will be injected with the current time regardless of the time from data. Data time is still used for arbitration.
Median filter length	The maximum number of locations stored by the median filter and used to generate the median location.

Parameter Name	Description
Mean filter length	The maximum number of median locations to store and use to generate the final filtered location.
Median filter reset length	After a jitter reset, the number of locations to prune the median filter's location store to.
Report interval	The interval between ws_status monitor messages.
Use local timezone	If true, parsed times are assumed to be in the same time zone as the service, otherwise UTC time is assumed.

GPS References

At least two GPS reference points are needed to convert GPS locations to the Cartesian coordinates used by the platform. These coordinates are defined by creating GPS Reference Point objects in the Types and objects workspace and then setting their x, y, latitude and longitude values in the Service parameters workspace.

The service also provides several types of GPS spatial zones that are used to control how/where the service injects locations, configured in a similar way to the reference points. These zones have the following effects:

GPS Exclusion Zone	Web source locations in this zone will be ignored and not injected.
GPS Inclusion Zone	If at least one inclusion zone is defined, web source locations outside this zone will be ignored and not injected.
GPS Removal Zone	Removal events will be injected for web source locations in this zone.
GPS Non Removal Zone	If at least one non-removal zone is defined, removal events will be injected for web source locations outside this zone.

To configure these zones, create a GPS Zone object in the Types and objects workspace and then in the Spatial properties workspace define a stationary shape for that object's GPS Zone **extent** property. In Service parameters, choose **GPS and web location sources** and **GPS Zone** and choose the object to set the type of zone it represents.

When zones overlap the following order of precedence is used; exclusion > removal > inclusion > non-removal.

Note that if you are using a transformation, the Cartesian coordinates of any reference points should be in the source coordinate system. Zones are applied post transformation and should be defined in the Ubisense coordinate system regardless of transformation.

Field Path Syntax

For XML/JSON sources, some configuration parameters use a field path syntax to allow the definition of paths to elements/objects that are nested or within a set/array. If your location objects are the root element/object of your source data and the data fields are direct descendants of those objects you do not need to use this syntax, simply use the XML element/JSON object names when defining you field names.

The field path syntax is a sequence of XML element/JSON object names, separated with a '.' character, with the topmost element/object on the left. For example in the JSON message in *Figure 1: Example JSON message with nested name field*, the name field would have the field path syntax of "locationObject.name".

```
{
   "locationObject":
   {
      "name": "object1",
      "x": 42,
      "y": 13,
      "z": 0
   }
}
```

Figure 1: Example JSON message with nested name field

```
<?xml version="1.0" encoding="UTF-8"?>
<locationObject>
  <name>object1</name>
  <x>42</x>
  <y>13</y>
  <z>0</z>
</locationObject>
```

Figure 2: Example XML message with nested name field

The syntax also supports paths to data at fixed indices in JSON arrays, or sets of XML elements defined at the same level with the same name, using an index in square brackets indexing from 0. For example, in the JSON message in *Figure 3: Example JSON message with a data array*, the name field of object1 would have the field path syntax of "locationObjects[0].name".

```
{
   "locationObjects":
   [{
      "name": "object1",
      "x": 42,
      "y": 13,
      "z": 0
   },
   {
      "name": "object2",
      "x": 8,
      "y": 59,
      "z": 0
   }]
}
```

Figure 3: Example JSON message with a data array

```
<?xml version="1.0" encoding="UTF-8"?>

<locationObjects>

  <element>

    <name>object1</name>

    <x>42</x>

    <y>13</y>

    <z>0</z>

  </element>

  <element>

    <name>object2</name>

    <x>8</x>

    <y>59</y>
    <z>0</z>
  </element>
</locationObjects>
```

Figure 4: Example XML message with a set of elements

Web Source Injector Example

The following walks you through an example of the configuration process for the Web Source Injector. It will cover how to set up the Web Source Injector to retrieve JSON data from a website and use it to inject tag locations.

Example Web Data

In this example we'll be using a web source that server JSON data to clients connecting to the URL **http://exampl locations**. The JSON data served has the following format:

```
{
  "sourceName": "example source",
  "locationObjects": [
    {
      "tagId": "0cb2b725c5f0",
      "tagType": "type1",
      "location": [
        12.2,
        6.6,
        0.93
      ],
    },
    {
      "tagId": "0cb2b725c5f2",
      "tagType": "type2",
      "location": [
        23.6,
        -12.3,
        0.89
      ],
    },
  ]
}
```

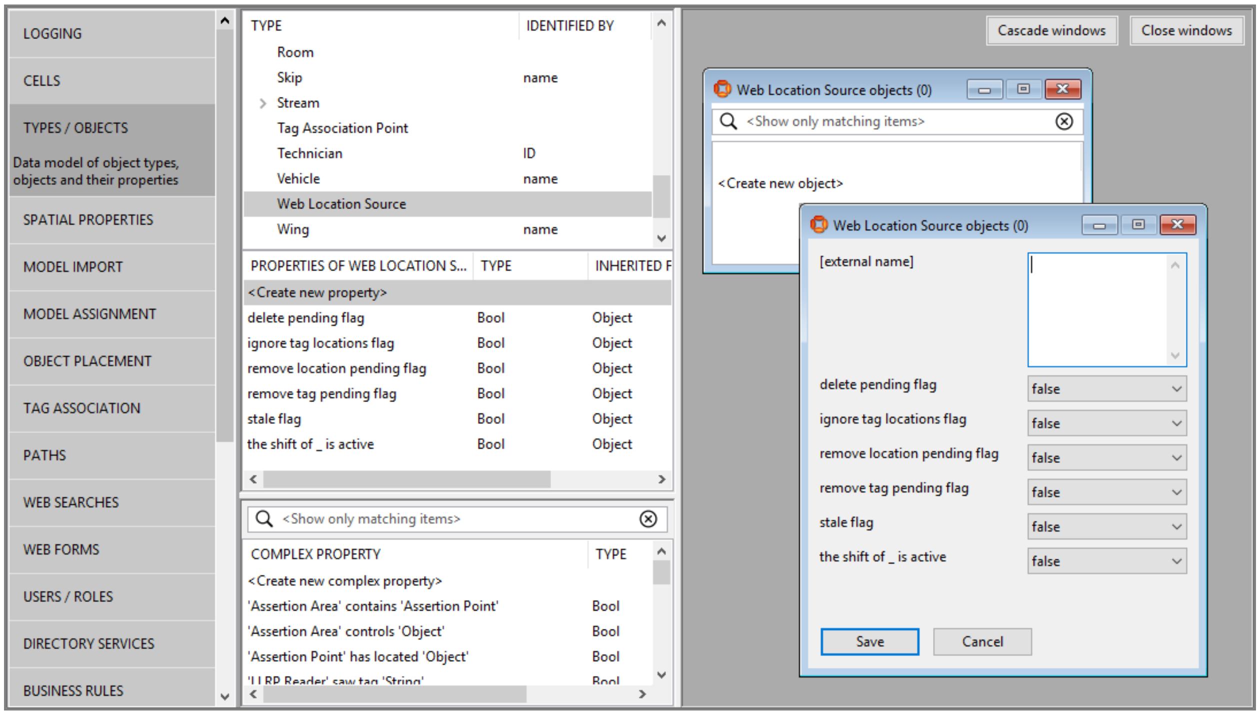
If you want to try out this example yourself without setting up your own web service, you can copy this example data to a text file and point your web source at it using the file URI scheme instead. For example, you could use the URI **file:///C:/source_data.txt** in place of the above URL, where the path following the **file:///** part is the path to your text file.

Example Configuration for the Web Source Injector

Creating the web sources

The configuration process is performed within SmartSpace Config. Firstly we need to go to the TYPES / OBJECTS tab and create some web source objects. You will need at least one web source object for each source address, and generally only one per source address. We'll be using a single source, called ExampleSource.

In the TYPES / OBJECTS tab, drag the **Web Location Source** type into the workspace and double-click **<Create new object>**. Create a new web location source object and click **Save**.



TYPE	IDENTIFIED BY
Room	
Skip	name
Stream	
Tag Association Point	
Technician	ID
Vehicle	name
Web Location Source	
Wing	name

PROPERTIES OF WEB LOCATION S...	TYPE	INHERITED F
<Create new property>		
delete pending flag	Bool	Object
ignore tag locations flag	Bool	Object
remove location pending flag	Bool	Object
remove tag pending flag	Bool	Object
stale flag	Bool	Object
the shift of _ is active	Bool	Object

<Show only matching items>

COMPLEX PROPERTY	TYPE
<Create new complex property>	
'Assertion Area' contains 'Assertion Point'	Bool
'Assertion Area' controls 'Object'	Bool
'Assertion Point' has located 'Object'	Bool
'LLRP Reader' saw tag 'String'	Bool

Web Location Source objects (0)

<Show only matching items>

<Create new object>

Web Location Source objects (0)

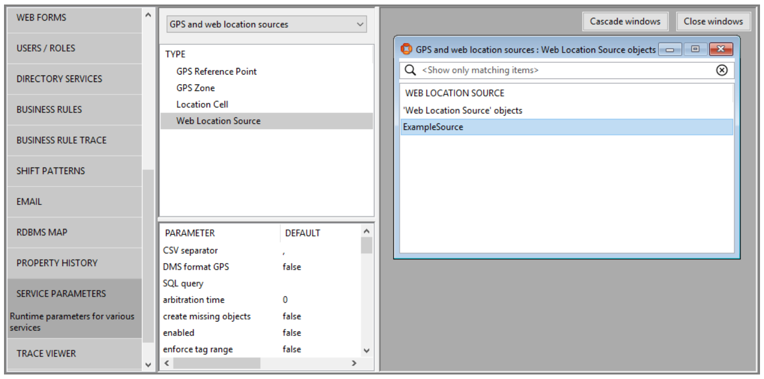
[external name]	
delete pending flag	false
ignore tag locations flag	false
remove location pending flag	false
remove tag pending flag	false
stale flag	false
the shift of _ is active	false

(In the TYPES / OBJECTS tab you can also create and configure GPS Zones and GPS Reference Points but we will not be needing them in this example.)

With the source created we can set up its properties in the SERVICE PARAMETERS tab.

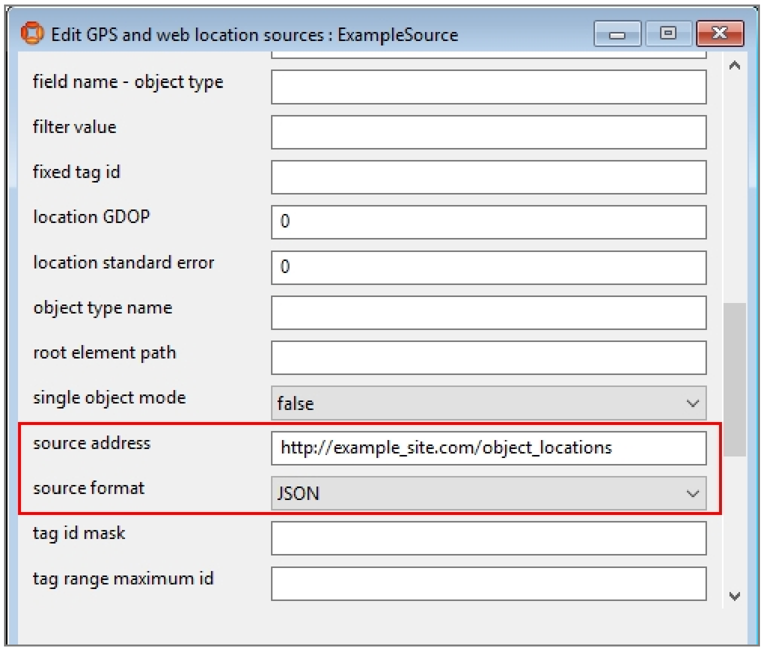
Configuring the connection

Next we need to configure the parameters for this web source so it can retrieve the data from our website. The parameters for our web sources can be found in the SERVICE PARAMETERS tab by choosing **GPS and web locations sources** configuration and then drag the Web Location Source type into the object browser.



PARAMETER	DEFAULT
CSV separator	,
DMS format GPS	false
SQL query	
arbitration time	0
create missing objects	false
enabled	false
enforce tag range	false

Open the parameter list for the web source you just created by double-clicking or dragging it into the workspace. Click **Edit** and set the source address to the URL of your source, **http://example_site.com/object_**
 in our case, and the source format, which will be **JSON** in this example. Also set the update interval to how frequently you want to retrieve data from this source (you will need to scroll to the end of the list for this parameter).


Edit GPS and web location sources : ExampleSource

field name - object type	
filter value	
fixed tag id	
location GDOP	0
location standard error	0
object type name	
root element path	
single object mode	false
source address	http://example_site.com/object_locations
source format	JSON
tag id mask	
tag range maximum id	

Configuring the parsing

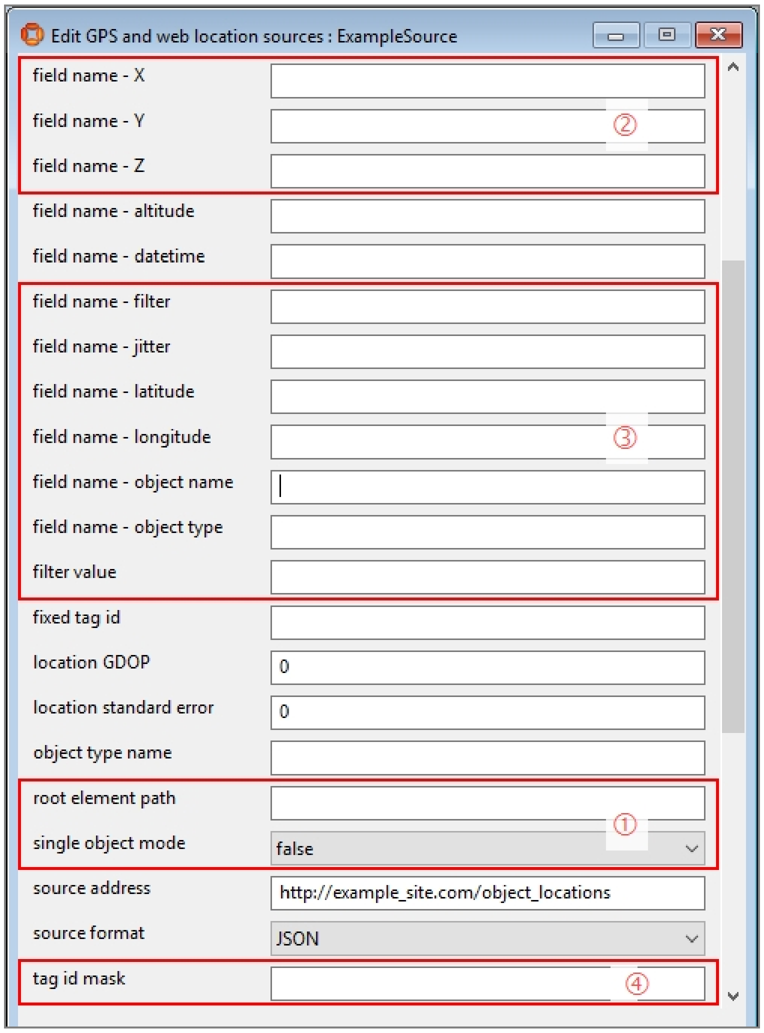
With the connection parameters set, the service should be able to retrieve a JSON string that looks like the example data. Now we need to tell the service how to parse this string. Firstly we need to set the root element path to the JSON object containing the location objects. For the example data the value of this is **locationObjects** (see *Field Path Syntax* for further details of the syntax). As the JSON object pointed to by this root element path contains an array of location objects, as opposed to a single location object, we also need to ensure single object mode is set to **false**. See 1 in the screenshot below.

Next we need to set the data labels. These are the names of the JSON members corresponding to each data field. Our sample data above has a tag id, tag type and location member. We will set **field name – object name** to **tagId** to point to the tag id. We will also set the location fields, **field name – x**, **field name – y**, **field name – z**, to point to the entries in the location array, **location[0]**, **location[1]** and **location[2]** respectively. See 2 in the screenshot below.

In this example we want our web source to only use locations for objects of type **type1**. For this we need to set **field name – filter** to **tagType** and **filter value** to **type1**. Any location object with a "tagType" value other than "type1" will be ignored. See 3 in the screenshot below.

The example source also uses 48 bit tag IDs but we want modify these IDs before we inject them into our platform, which use 64 bit IDs, such that the leading 16 bits are 1s. We will need to set the tag id mask to **FFFF000000000000** for this, the hex representation of this mask, which will be bitwise ORed with the tag IDs read from the data. See 4 in the screenshot below.

Note that setting a mask is not necessarily required when using tag id of fewer than 64 bit, we are just doing it here as an example.



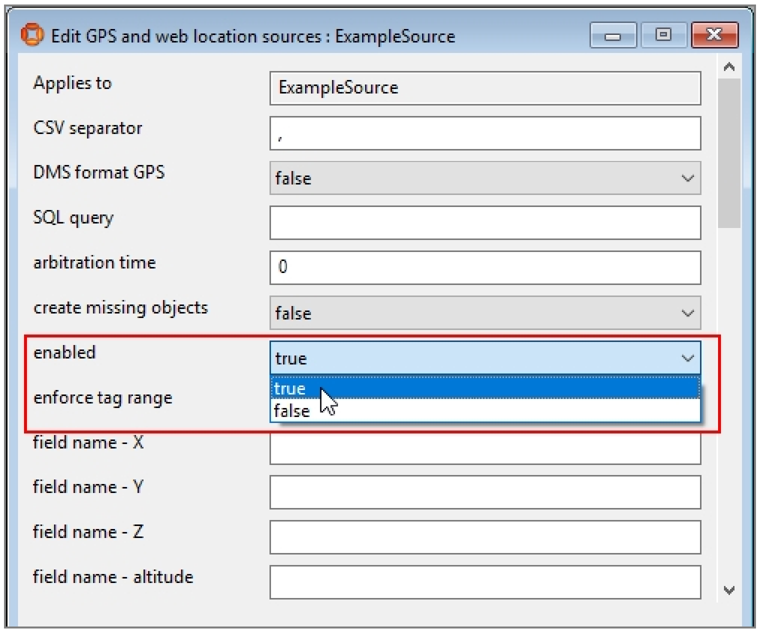
field name - X	
field name - Y	
field name - Z	
field name - altitude	
field name - datetime	
field name - filter	
field name - jitter	
field name - latitude	
field name - longitude	
field name - object name	
field name - object type	
filter value	
fixed tag id	
location GDOP	0
location standard error	0
object type name	
root element path	
single object mode	false
source address	http://example_site.com/object_locations
source format	JSON
tag id mask	

Additional configuration

The Web Source Injector service offers several other configurations options including parameters for filtering, transforming coordinates and other tag/object options but we are not using any of these in our example here. See *Configuration Parameters for Web Source Injector* for details on how to use these other parameters.

Enabling the web source

With the configuration process complete, we need to set the enabled parameter for this web source to true. The service will then attempt to retrieve data from the source address and inject locations.

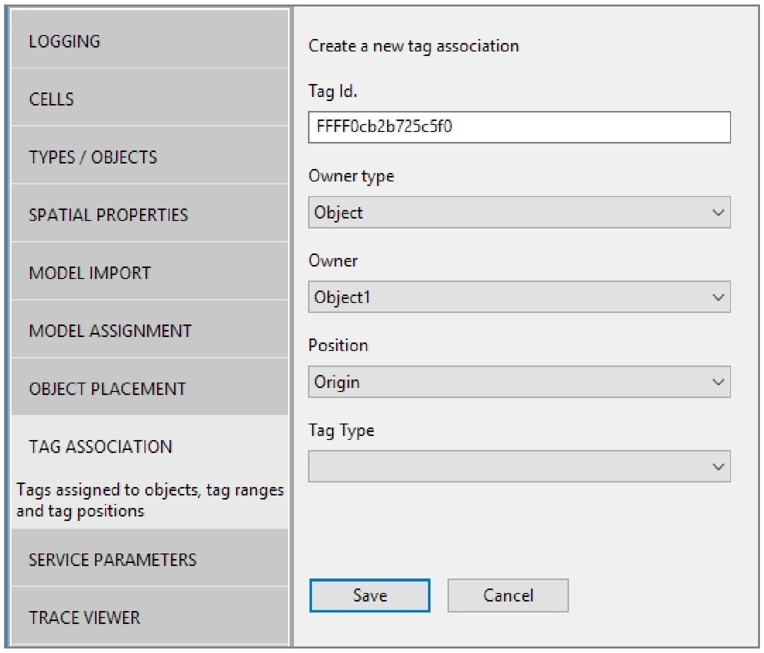


Applies to	ExampleSource
CSV separator	,
DMS format GPS	false
SQL query	
arbitration time	0
create missing objects	false
enabled	true
enforce tag range	
field name - X	
field name - Y	
field name - Z	
field name - altitude	

Viewing locations

With the web source set up we should be getting locations injected based on the source data. As the data source is a tag source, these locations are injected as tag locations; we need to associate these tag IDs with objects to be able to view the injected locations in SmartSpace Config.

In the TAG ASSOCIATION tab, select the **Associate tag with object** option then select the appropriate object and input your tag Id. For the first tag in our example data, using our example tag id mask, the id would be **FFFF0cb2b725c5f0**.



Create a new tag association

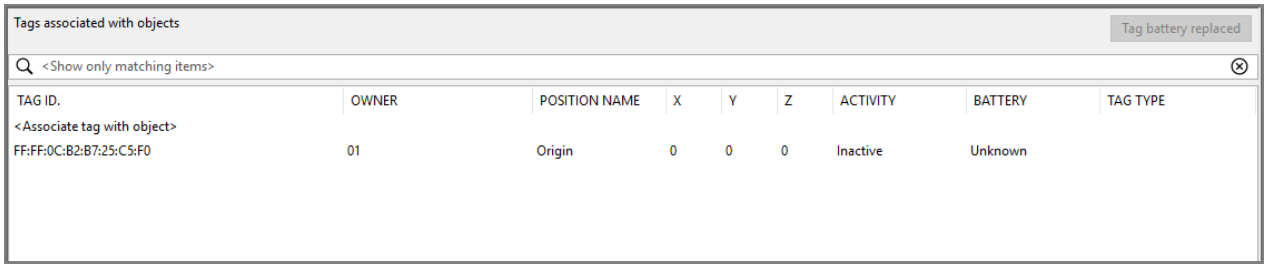
Tag Id.: FFFF0cb2b725c5f0

Owner type: Object

Owner: Object1

Position: Origin

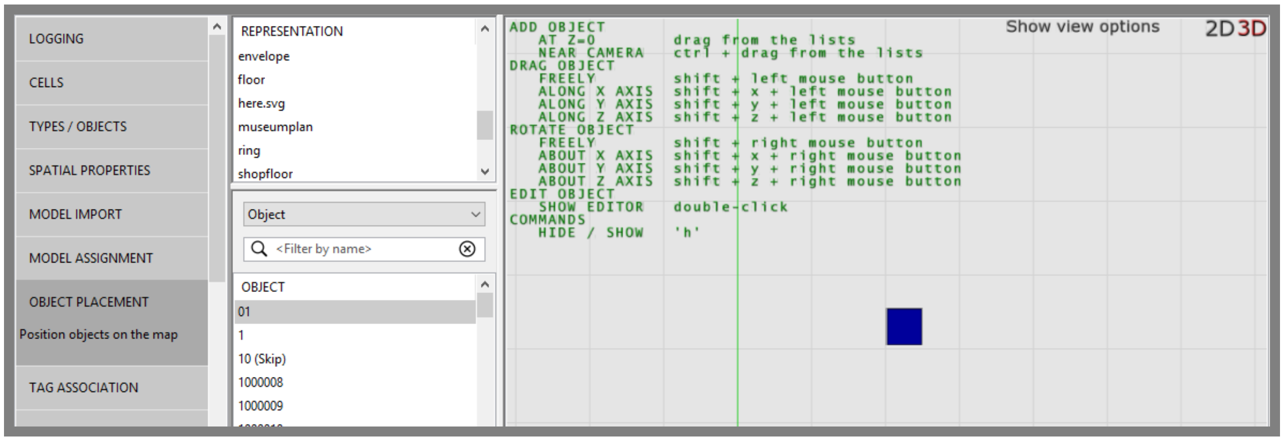
Tag Type:



Tags associated with objects

TAG ID.	OWNER	POSITION NAME	X	Y	Z	ACTIVITY	BATTERY	TAG TYPE
<Associate tag with object>								
FF:FF:0C:B2:B7:25:C5:F0	01	Origin	0	0	0	Inactive	Unknown	

After associating this tag with an object, and assigning a representation to that object's type, you should be able to see the object located on the map in the OBJECT PLACEMENT tab so long as it would be located in one of your location cells.



```
ADD OBJECT
   AT Z=0             drag from the lists
   NEAR CAMERA        ctrl + drag from the lists
DRAG OBJECT
   FREELY             shift + left mouse button
   ALONG X AXIS       shift + x + left mouse button
   ALONG Y AXIS       shift + y + left mouse button
   ALONG Z AXIS       shift + z + left mouse button
ROTATE OBJECT
   FREELY             shift + right mouse button
   ABOUT X AXIS       shift + x + right mouse button
   ABOUT Y AXIS       shift + y + right mouse button
   ABOUT Z AXIS       shift + z + right mouse button
EDIT OBJECT
   SHOW EDITOR        double-click
COMMANDS
   HIDE / SHOW        'h'
```

Glossary

D

Data field

A single data entry used in generating locations e.g. the x coordinate of the location

L

Location object

Data for an individual location as found in location messages

M

Message

A response from a web source that contains location data

W

Web source

A URL or SQL database that responses to web requests with location data