

Extending GeoJSON for EPOS

Purpose

A number of work packages have requested additional features be supported by the GUI, currently the GUI supports GeoJSON, but GeoJSON doesn't support the desired features. At this late stage it has been deemed too risky to introduce another format and associated development effort, therefore an alternative solution is to propose EPOS specific extensions to the GeoJSON format.

Requirements

A brief list of the features desired by work packages:

Requirement	Description
Map Markers	The GeoJSON can optionally specify the styling and behaviour of map markers
Image Overlays	The GeoJSON can contain image references that will be displayed as overlays on the map (not geo-tiff)
Legends	Information derived from the Map Markers and Image Overlays can be used to generate map legends
Map Popup content	The GeoJSON can express some control over the properties used to dynamically generate map popups
Data Visualisation Columns	The GeoJSON can express some control over the properties used to dynamically generate data visualisation columns
Links	The GeoJSON properties can include additional information on (hyper)links to include in the map popups and/or data visualisation

@epos JSON objects

All new root JSON objects introduced to support EPOS functionality will be accessible via attribute names that start with `@epos_`, this is with a view to avoid name clashes and false positives parsing the GeoJSON for EPOS specific information.

All EPOS specific JSON objects are optionally, if any are missing sensible default behaviour will be followed ensuring the raw GeoJSON can still be rendered.

Example

```
{  
    "type": "FeatureCollection",  
    "@epos_style": {  
        ...  
    }  
    ...  
}
```

Styling

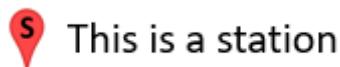
The styling of map markers and map legends for **GeoJSON points** is defined by the `@epos_style` object, the object contains attributes named such that they correspond to the value(s) of the `@epos_type` attribute defined within the `properties` objects of geojson `feature`.

Example

In the example below there is a `feature` with an `@epos_type = station`, this matches the attribute `station` within the the `@epos_style` object, hence in this case stations would be rendered on the map as pins with an 's'.



A corresponding legend would be generated, looking something like:



feature:

```
"features": [  
    {  
        "type": "Feature",  
        "properties": {  
            "@epos_type": "station", //used to lookup @epos_style attributes  
            ...  
        }  
    }  
]
```

style:

```
{
  "type": "FeatureCollection",
  "@epos_style": {
    //attribute names to match with @epos_type values
    "station": {
      "label": "This is a station", //use for legend
      "marker": {
        "character": "S", //character type value
        "pin": true, //true|false
        "clustering": true //true|false
        //"anchor":"C" not needed when pin=true
      }
    },
    ...
  }
}
```

Style Attributes

Each `@epos_type` defined in the `@epos_style` object defines the following:

Attribute	Description
<code>label</code>	If provided, this is used as the text to associate with the map marker in the legend, else the <code>@epos_type</code> is used as the legend text
<code>marker</code> (object)	If provided, attributes of this object define the marker for the <code>@epos_style</code> , else a default point marker will be used, e.g. 
<code>marker.pin</code>	Defaults to <code>true</code> if absent, if true the map symbol will be drawn with in a pin, e.g. 
<code>marker.clustering</code>	Defaults to <code>true</code> if absent, if true map markers in close proximity to each other will be "clustered"
<code>marker.anchor</code>	If <code>pin = false</code> the anchor point for the symbol can be defined using the eight points of the compass (N,NE,E,SE,S,SW,W,NW,C), or C for centre. If <code>pin = true</code> the anchor point will always be assumed to be S (the tip of the pin).

Symbols

There are three types of symbol that can be used (only one should be used), these are defined by setting the appropriately name attribute within the `marker` object, these are:

Type	Example	<code>pin = false</code>	<code>pin = true</code>
<code>marker.href</code>	<code>"www.thing.com/thing.png"</code>		
<code>marker.fontawesome_class</code>	<code>"fas fa-star"</code>		
<code>marker.character</code>	<code>"S"</code>		

Image Example

```
"thing": {  
    "label": "This is a thing", //use for legend  
    "marker": {  
        "href": "www.thing.com/thing.png", //image url type value  
        "pin": false, //true|false  
        "clustering": false, //true|false  
        "anchor": "C" // N|NE|E|SE|S|SW|W|NW|C (default: C) used when  
pin=false  
    }  
},
```

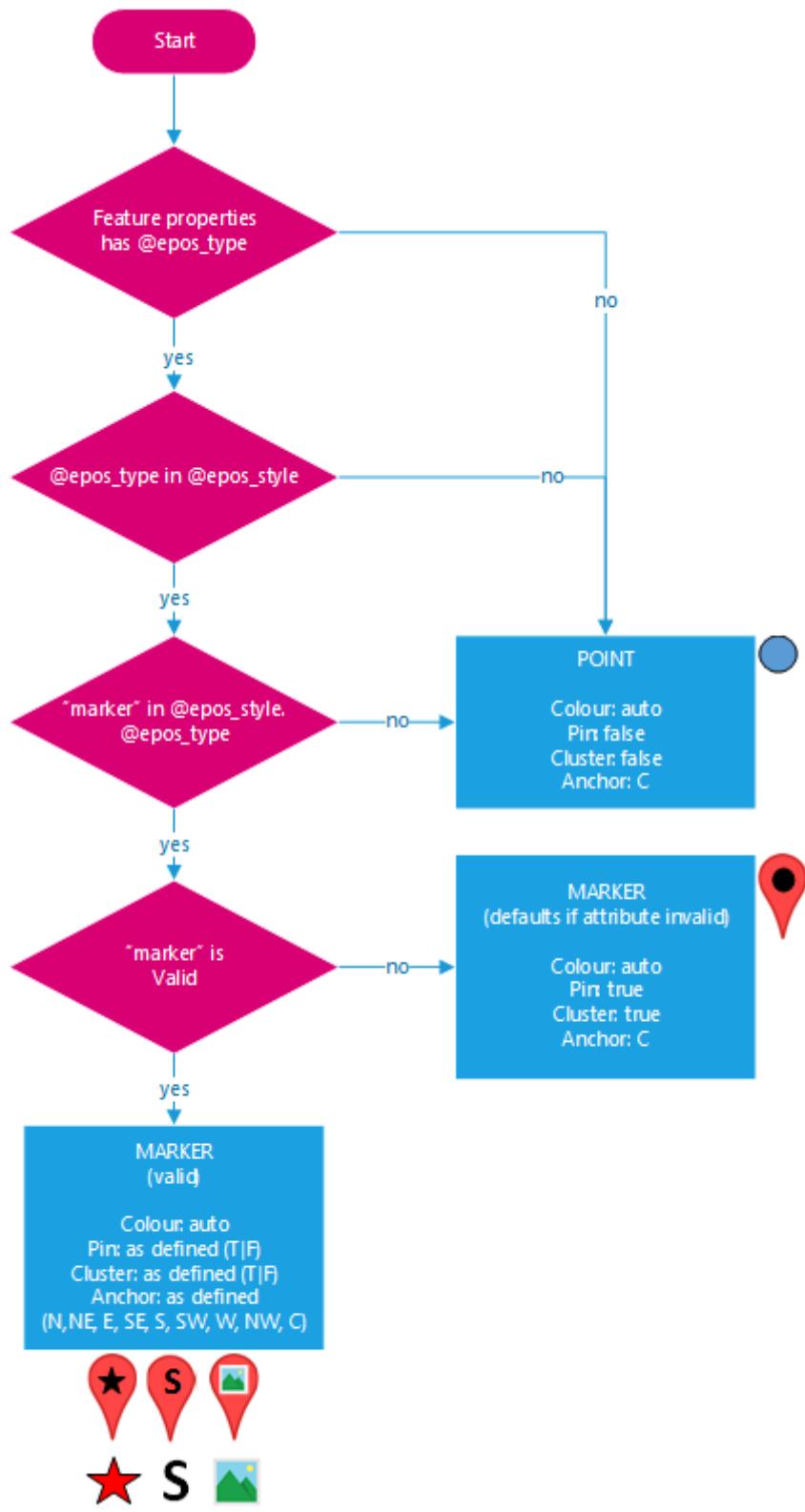
Font Awesome Example

```
"event": {  
    "label": "This is an event", //use for legend  
    "marker": {  
        "fontawesome_class": "fas fa-star", //fontawesome-class type  
value  
        "pin": false, //true|false  
        "clustering": false, //true|false  
        "anchor": "C" // N|NE|E|SE|S|SW|W|NW|C (default: C) used when  
pin=false  
    }  
},
```

Character Example

```
"station": {  
    "label": "This is a station", //use for legend  
    "marker": {  
        "character": "S", //character type value  
        "pin": true, //true|false  
        "clustering": true //true|false  
        //"anchor":"C" not needed when pin=true  
    }  
},
```

Symbol Logic

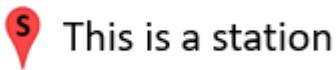


Colour

A note on colour, to prevent accidental reuse of the same colour by multiple map layers in the EPOS GUI, colours will be automatically assigned.

Legends

Legends are constructed by combining the map `marker` and `label` from the corresponding `@epos_type` within the the `@epos_style` object.



Legend Logic

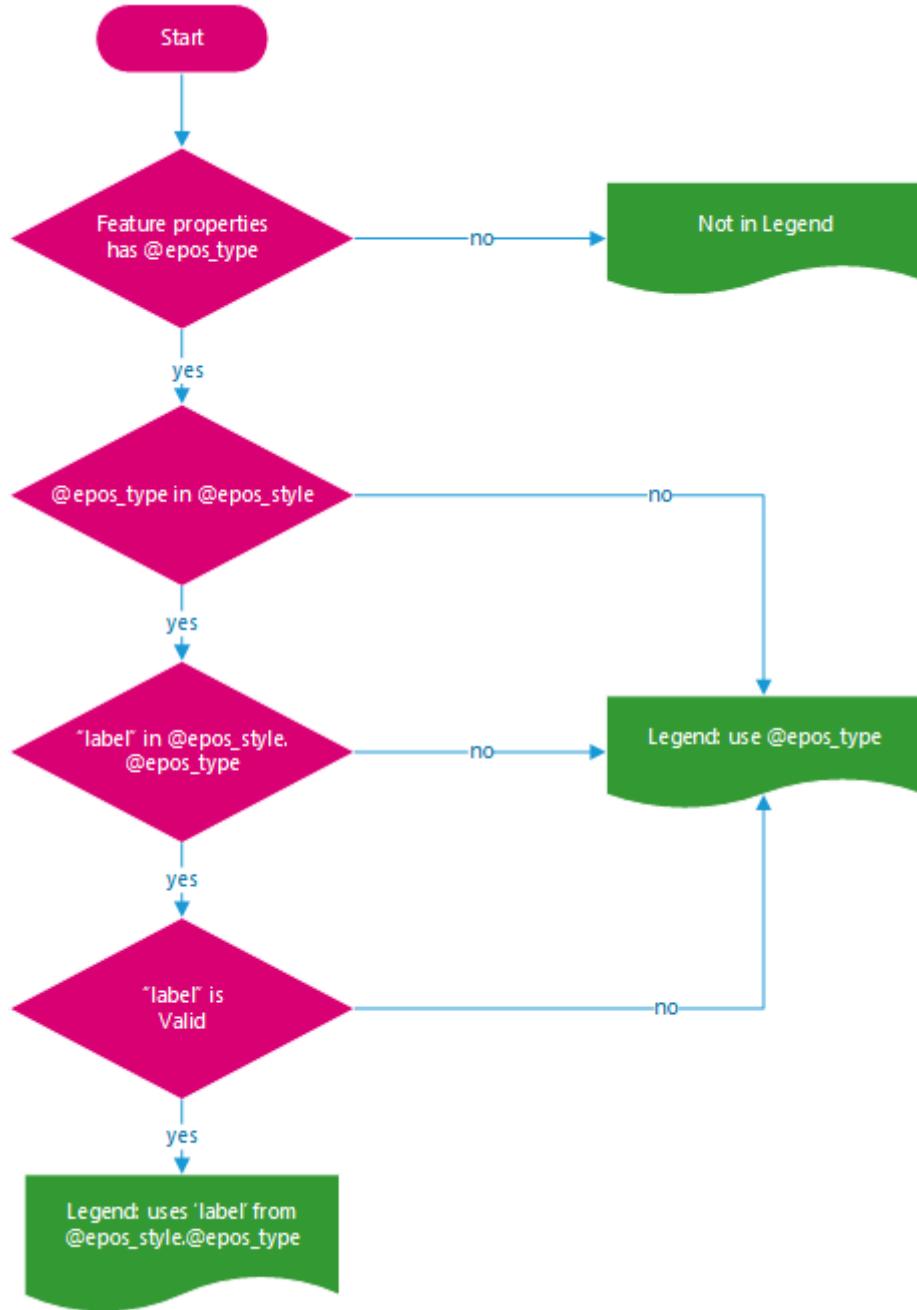


Image Overlays

Image overlays (geo referenced images) are supported by adding an `@epos_image_overlay` objects to a **GeoJSON feature**. There is a 1:1 mapping between the feature and the overlay - that way the `properties` for the feature can be used for the image overlay.

Example

```
...  
{  
  "type": "Feature",  
  "properties": {  
    "@epos_type": "overlay",  
    ...  
  }  
}
```

```

    ...
    },
    "@epos_image_overlay": // not supporting GeoTIFF - normal images
only
{
    "href":
"https://sandbox.zenodo.org/2017062703_sd_era_4rlks.unw.png",
    "bbox": [ // position on map
        -4.5184, // spatial reference for the bbox
        36.4027, // is assumed to match the spatial
        -3.2463, // reference for the GeoJSON object
        37.7806
    ],
    "legend": {
        "href": "www.abc.com/legend-image.png" //legend image
    }
},
"geometry": null //NO GEOMETRY FOR OVERLAY
}
...

```

Image Overlay Attributes

Each `@epos_image_overlay` object defined should have the following:

Attribute	Description
<code>href</code>	The URL to the image to display on the map
<code>bbox</code>	The bounding box (rectangular region) in which to place the image
<code>Legend</code>	A <code>Legend</code> object can be include to provide a legend appropriate for the image overlay
<code>Legend.href</code>	The only property of the <code>Legend</code> object currently supported is a image URL to be used as the legend for the overlay

Image Types

A conscious decision has been made to **not** support GeoTIFF in this iteration of development of the EPOS GUI, hence it assumed that Leaflet <https://leafletjs.com/> will support the same image types as commonly supported by browsers.

Geometry

The geometry for the feature containing the `@epos_image_overlay` object will be ignored, therefore should ideally be set to `null`. The reason for this is that it is essential the image overlay has rectangular geographic bounds, hence a `bbox` has been defined in the `@epos_image_overlay` object.

bbox

The spatial reference for the `bbox` is assumed to match the spatial reference for the containing GeoJSON object(s).

Caution: if the area crosses the antimeridian (often confused with the International Date Line), you must specify corners outside the [-180, 180] degrees longitude range.

<https://leafletjs.com/reference-1.5.0.html#latlngbounds>

Feature Properties

In GeoJSON a `feature` can define a `properties` object, this object contains *metadata* about the feature.

The EPOS GeoJSON extension adds three ways in which the data-author can express some control over how those properties are used within the EPOS GUI. The approach taken is to introduce `@epos_xxx` attributes that reference other *true* `properties` of the `feature`, the reason for this are to:

- prevent duplication of *metadata* just to satisfy the EPOS GUI.
- maintain the *true* GeoJSON properties that may be needed in other contexts.

@epos_label_key

The value for the `@epos_label_key` attribute should be the name of **one** *true* attribute of the `properties` object that is to be used when ever a label, title, tool-tip etc. is needed within the EPOS GUI.

```
"features": [
  {
    "type": "Feature",
    "properties": {
      ...
      "@epos_label_key": "Title", //used for things like tooltips
      ...
      "Title": "adasdasdd",
      ...
    }
  }
]
```

@epos_map_keys

The value for the `@epos_map_keys` attribute should be the **ordered** names of **one or more** *true* attributes of the `properties` object that are to be used in the `map` context within the EPOS GUI, for example to define the properties display in the map popup.

```
"features": [
  {
    "type": "Feature",
    "properties": {
      ...
      "@epos_map_keys": [ //typically used for map popups
        "Title",
        "Description",
        "Summary",
        "@epos_links"
      ],
      ...
      "Title": "adasdasdd",
      "Description": "Hellenic Seismic Network",
      ...
    }
  }
]
```

```

    "Summary": "Properties can contain HTML <img
src=\"smiley.gif\">",
    "@epos_links": [...]

```

@epos_data_keys

The value for the `@epos_data_keys` attribute should be the **ordered** names of **one or more true** attributes of the `properties` object that are to be used in the **data-visualisation** context within the EPOS GUI, for example to define the columns to display in the data table.

```

"features": [
  {
    "type": "Feature",
    "properties": {
      ...
      "@epos_data_keys": [ //typically used for data visualisation
columns
      "Title",
      "Elevation",
      "Description"
    ],
    "Title": "my title",
    "Elevation": "122",
    "Description": "Hellenic Seismic Network",
    ...
  }
]

```

Default Behaviour

If the relevant `@epos_` attribute for the context is missing or empty the EPOS GUI will revert to a default behaviour:

Context	Missing/Empty	Default Behaviour
Labelling	<code>@epos_label_key</code>	All (non <code>@epos_</code>) primitive (strings) property names will be searched (case-insensitive) for the following: <code>name, title, label, description</code> in that order. If no property is found then there will be no labelling for that feature.
Map	<code>@epos_map_keys</code>	All (non <code>@epos_</code>) primitive (numbers, strings, booleans, primitive-arrays) properties will be used in an arbitrary order, for example to populate the content of a map popup.
Data Visualisation	<code>@epos_data_keys</code>	All (non <code>@epos_</code>) primitive (numbers, strings, booleans, primitive-arrays) properties will be used in an arbitrary order, for example to populate the columns of the data visualisation.

Types of Properties

As mentioned above, in general the only properties that the EPOS GUI will support are those with primitive (numbers, strings, booleans, primitive-arrays) values.

Links

`@epos_links` is a special type of property introduced to support the addition of (hyper)links that require an individual object per link to capture the `href`, `label`, and `type`:

```
"features": [
  {
    "type": "Feature",
    "properties": {
      ...
      "@epos_map_keys": [ //typically used for map popups
        "Title",
        "@epos_links"
      ],
      "@epos_data_keys": [ //typically used for data visualisation
columns
        "Title",
        "@epos_links"
      ],
      "Title": "my title",
      "@epos_links": [
        {
          "href": "http://volobsis.ipgp.fr/volcano-bullecep.pdf",
          "label": "Download",
          "type": "application/pdf"
        },
        {
          "href": "https://sandbox.zenodo.org/20170703.unw.png",
          "label": "Preview",
          "type": "image/x-icon"
        },
        {
          "href": "https://creativecommons.org/licenses/by-
sa/4.0/",
          "label": "License",
          "type": "text/html"
        }
      ]
    }
  }
]
```

Summary

Type	Context	Example
boolean	Map Data	"Active": true
number	Map Data	"Height": 123
string	Label Map Data	"Title": "my title"
HTML-string	Map	"Summary": "Properties can contain HTML "
array [boolean number string]	Map Data	"Institution": ["Institution 1", "Institution 2", "Institution 3"]
array [boolean number string HTML-string]	Map	"Institutions": ["Institution "]
@epos_links object	Map Data	"@epos_links": [{"href": "http://volobosis.ipgp.fr/volcano-bullexcep.pdf", "label": "Download", "type": "application/pdf" }]

Full Sample

```
{
  "type": "FeatureCollection",
  "@epos_style": {
    //attribute names to match with @epos_type values
    "station": {
      "label": "This is a station", //use for legend
      "marker": {
        "character": "S", //character type value
        "pin": "true", //true|false
        "clustering": "true" //true|false
        //anchor:"C" not needed when pin=true
      }
    },
    "event": {
      "label": "This is an event", //use for legend
      "marker": {
        "fontawesome_class": "fas fa-star", //fontawesome-class type
        "pin": "false", //true|false
        "clustering": "false", //true|false
        "anchor": "C" // N|NE|E|SE|S|SW|W|NW|C (default: C) used when
        pin=false
      }
    },
    "thing": {
      "label": "This is a thing", //use for legend
      "marker": {
        "href": "www.thing.com/thing.png", //image url type value
        "pin": "false", //true|false
        "clustering": "false", //true|false
      }
    }
  }
}
```

```

        "anchor": "C" // N|NE|E|SE|S|SW|W|NW|C (default: C) used when
pin=false
    }
}
},
"features": [
{
    "type": "Feature",
    "properties": {
        "@epos_type": "event", //used to lookup @epos_style attributes
        "@epos_label_key": "Title", //used for things like tooltips
        "@epos_map_keys": [ //typically used for map popups
            "Title",
            "Description",
            "Summary",
            "@epos_links"
        ],
        "@epos_data_keys": [ //typically used for data visualisation
columns
            "Title",
            "Description",
            "@epos_links"
        ],
        "Title": "my title",
        "Institutions": [ // array of primitives
            "Insitution 1",
            "Insitution 2",
            "Insitution 3"
        ],
        "Elevation": "122",
        "Description": "Hellenic Seismic Network",
        "Summary": "Properties can contain HTML <img
src=\"smiley.gif\">",
        "@epos_links": [
{
            "href": "http://volobsis.ipgp.fr/volcano-bullecep.pdf",
            "label": "Download",
            "type": "application/pdf"
},
{
            "href": "https://sandbox.zenodo.org/20170703.unw.png",
            "label": "Preview",
            "type": "image/x-icon"
},
{
            "href": "https://creativecommons.org/licenses/by-
sa/4.0/",
            "label": "License",
            "type": "text/html"
}
]
},
"geometry": {
        "type": "Point",
        "coordinates": [
            24.38591,
            40.93704
        ]
    }
}
]
```

```

        }
    },
{
    "type": "Feature",
    "properties": {
        "@epos_type": "overlay",
        // for image overlays, used as label on sub layer & legend &
        tooltip
            "@epos_label_key": "Name",
            "@epos_map_keys": [
                "Name",
                "Description",
                "Elevation",
                "Preview"
            ],
            "@epos_data_keys": [
                "Name",
                "Description",
                "Elevation"
            ],
            "Name": "My layer Label",
            "Elevation": "500",
            "Description": "Hellenic Seismic Network",
            "Preview": "some HTML <img src=\"smiley.png\">",
        },
        "@epos_image_overlay": // not supporting GeoTIFF - normal images
only
{
    "href":
"https://sandbox.zenodo.org/2017062703_sd_era_4rlks.unw.png",
    "bbox": [ // position on map
        -4.5184, // spatial reference for the bbox
        36.4027, // is assumed to match the spatial
        -3.2463, // reference for the GeoJSON object
        37.7806
    ],
    "legend": {
        "href": "www.abc.com/legend-image.png" //legend image
    }
},
    "geometry": null //NO GEOMETRY FOR OVERLAY
}
]
}

```