



Practical Guide for Building a 3D Web App from 2D Data




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Kristian Ekenes

-  Product Engineer JS API
-  Data visualization, Smart Mapping, Arcade
-  Redlands, California

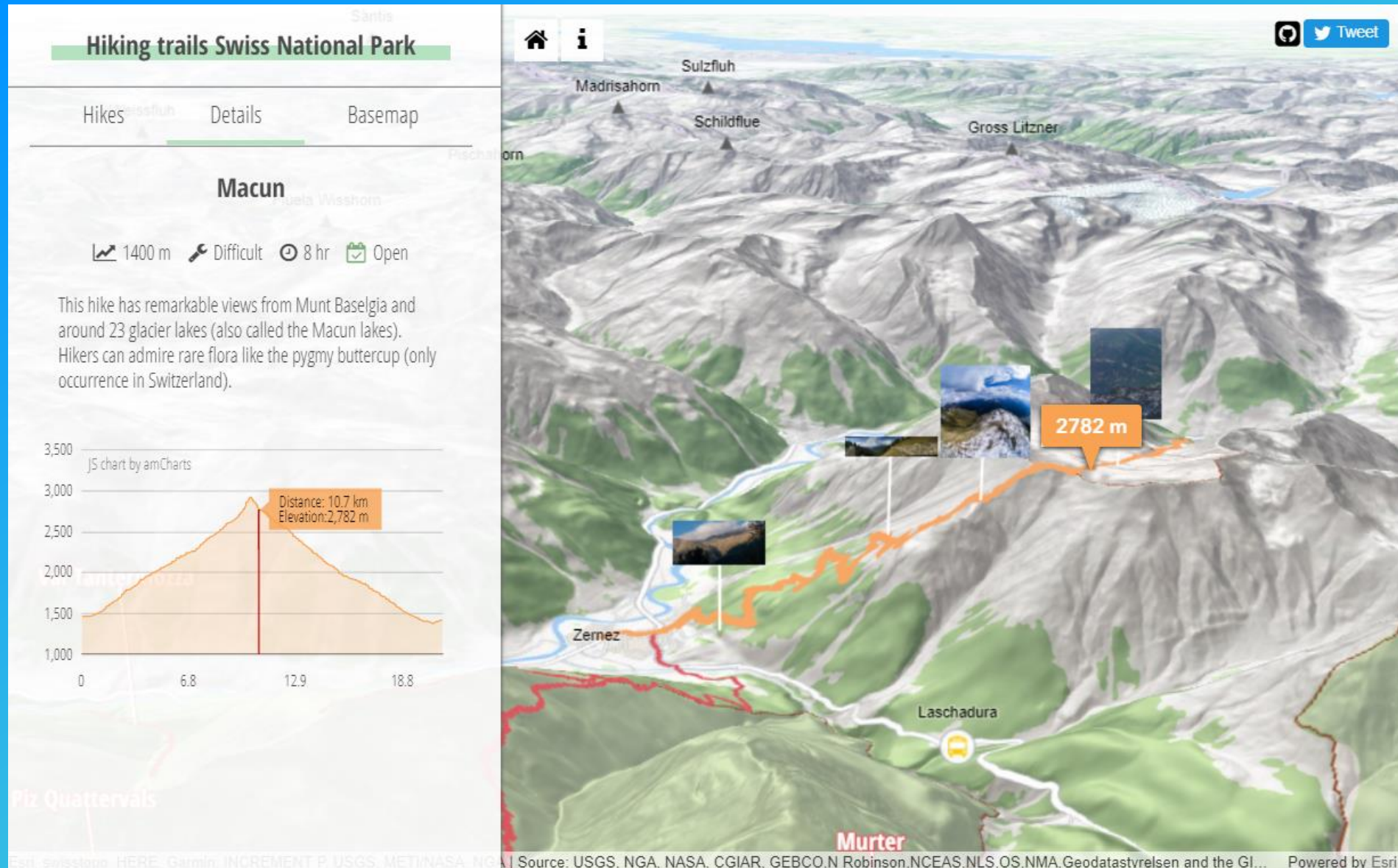


Raluca Nicola

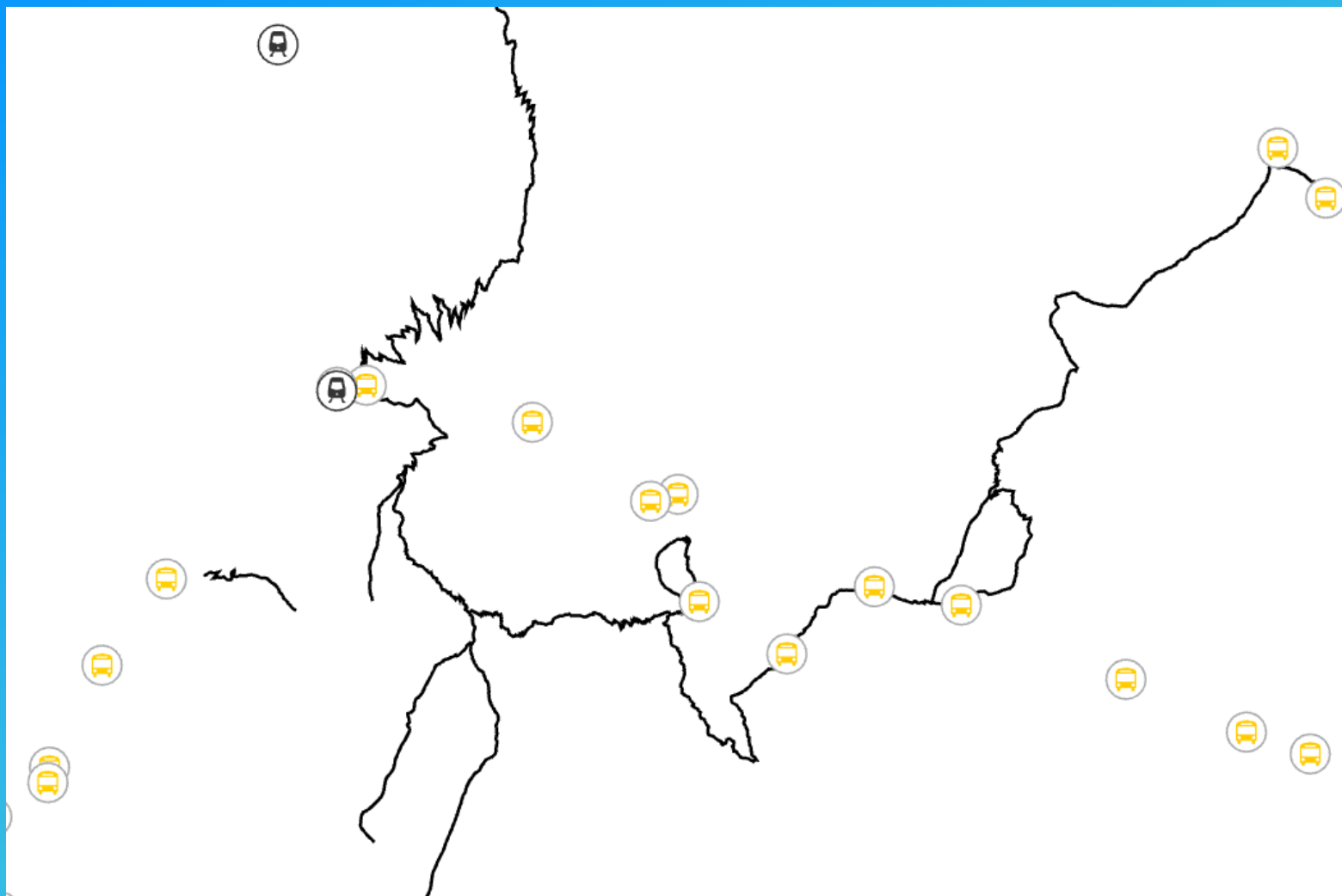
-  Product Engineer JS API
-  Data visualization, 3D
-  Zurich, Switzerland

You will learn

how to create this



when all you have is this

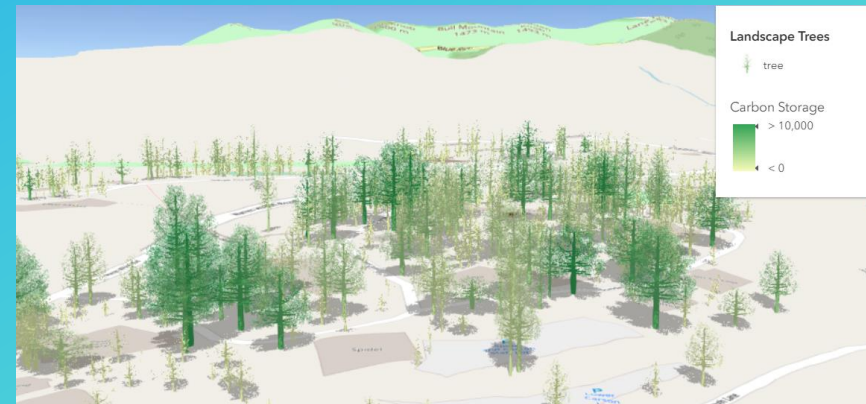
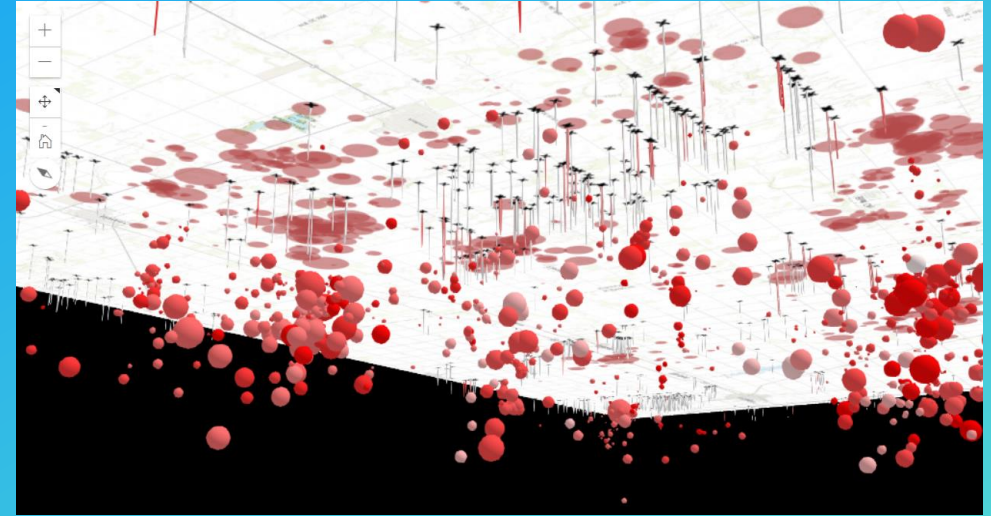


how to create a 3D analysis app



with 2D data

and some other examples



Airspace encroachment analysis

Hiking trails –
Swiss National Park

20 min

20 min

Other visualizations

10 min

Hiking trails Swiss National Park

Hikes Details Basemap

Macun

1400 m Difficult 8 hr Open

This hike has remarkable views from Munt Baselgia and around 23 glacier lakes (also called the Macun lakes). Hikers can admire rare flora like the pygmy buttercup (only occurrence in Switzerland).

Distance: 11 km
Elevation: 2,743 m

Map labels: Madrisahorn, Sulzfluh, Schildflue, Gross Litzner, Pischahorn, Susch, Zernez, Laschadura.

Peak elevation callout: 2743 m

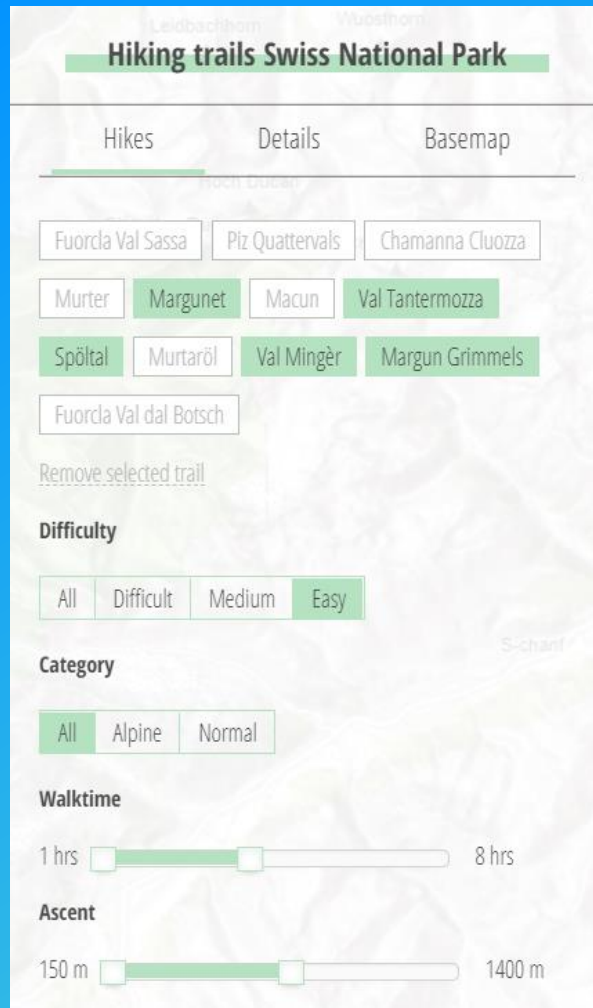
Source: USGS, NGA, NASA, CGIAR, GEBCO, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen and the GI... Powered by Esri

Hiking trails

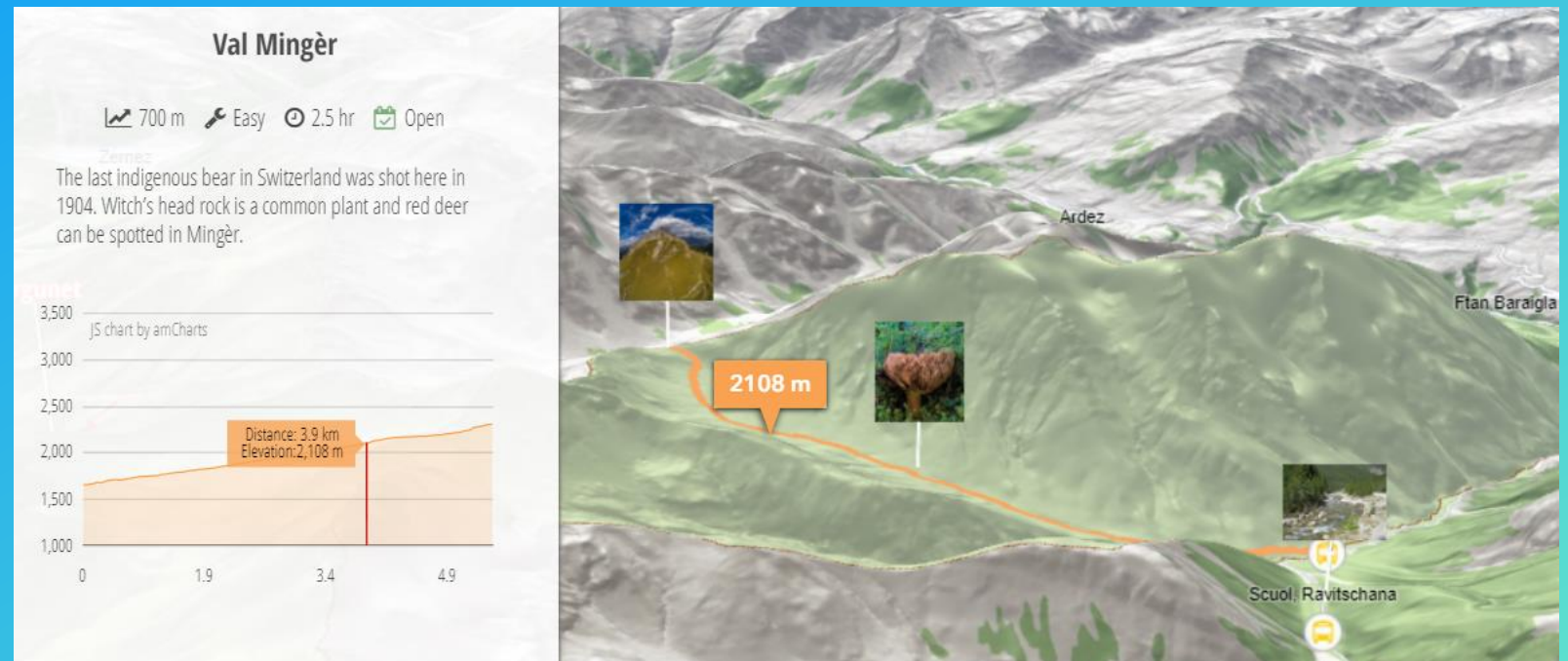
Swiss National Park

Goals

View and filter trails



Show details about each path: description, elevation profile, images



Resources

Swiss National Park

Hiking trails - 2D line data

Bus stops – 2D points

OSM

Mountain peaks – 2D points

Village names – 2D points

ESRI

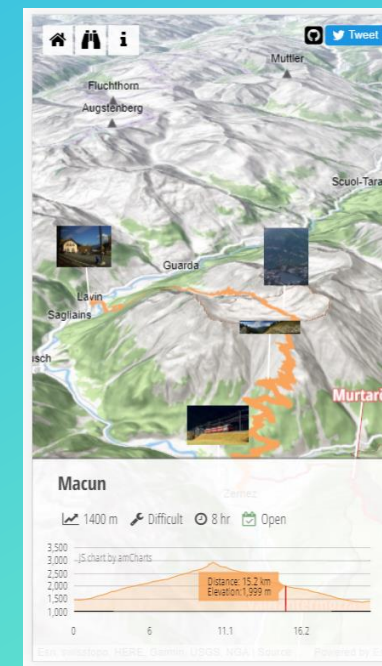
Basemaps & satellite imagery

Elevation service

Flickr

Image REST API

ArcGIS API for
JavaScript
(& AMCharts)



Filtering

definitionExpression – an SQL clause used for client side feature filtering

```
layer.definitionExpression = "RouteId = 10 OR RouteId = 20";
```

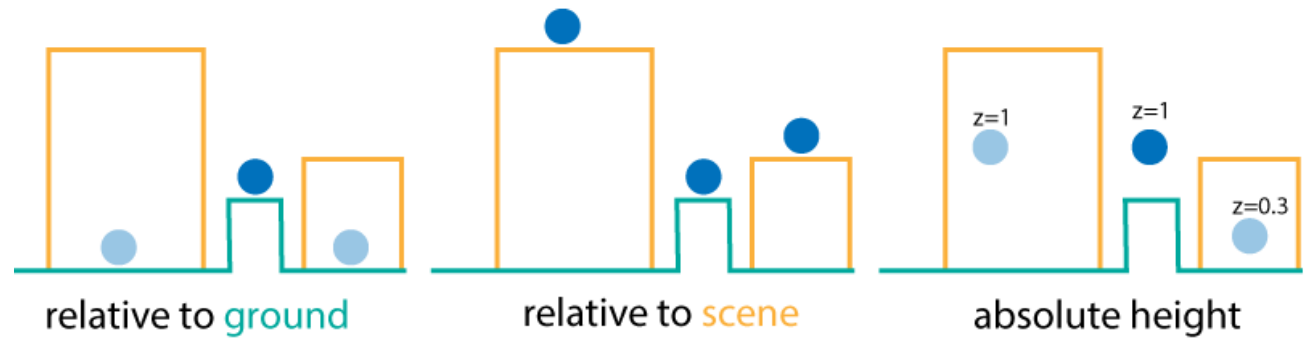
Elevation profile

elevationLayer.queryElevation – queries the elevation layer for elevation values for the given geometry

```
// call the queryElevation method on the ground
// with 2D geometry (multipoint, point, line)
elevationLayer.queryElevation(feat.geometry, {
  demResolution: "finest-contiguous"
  noData: 1500
})
.then((response) => {
  // prints geometry with z values obtained
  // by querying the underlying elevation service value
  console.log(response.geometry);
});
```

elevationInfo

```
var feature = new FeatureLayer({  
  //other properties...  
  elevationInfo: {  
    mode: "relative-to-ground"  
  }  
});
```



on the ground



relative to ground

Line labeling

Labels with callouts on lines

Hiking trail 1



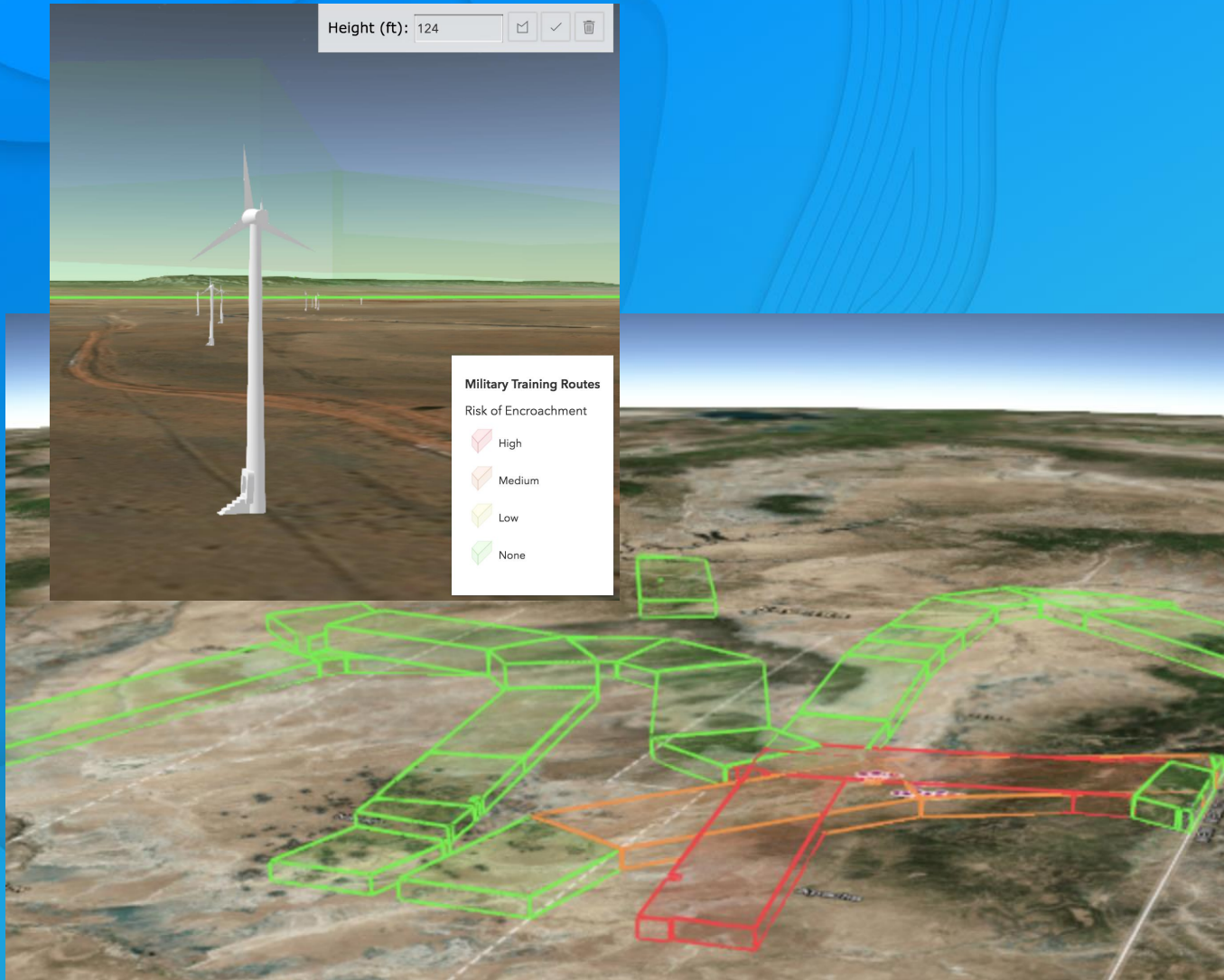
```
new FeatureLayer({
  // set properties like url and renderer here
  labelsVisible: true,
  labelingInfo: [new LabelClass({
    symbol: new LabelSymbol3D({
      symbolLayers: [new TextSymbol3DLayer({...})],
      verticalOffset: {
        screenLength: 80,
        maxWorldLength: 3000,
        minWorldLength: 200
      },
      callout: {
        type: "line",
        size: 1,
        color: "white"
      }
    })
  })],
  labelExpressionInfo: { expression: `$feature.name` }
});
```

Set images in the scene

IconSymbolLayer works with any image

on click add it to the DOM and transition it to full screen

```
const billboard = new PointSymbol3D({
  symbolLayers: [new IconSymbol3DLayer({
    size: 50,
    resource: {
      href: `https://url.com/image.jpg`;
    }
  })],
  verticalOffset: {
    screenLength: 50,
    maxWorldLength: 3000
  },
  callout: {
    type: "line",
    size: 1,
    color: "white"
  }
});
```



Airspace Encroachment Analysis

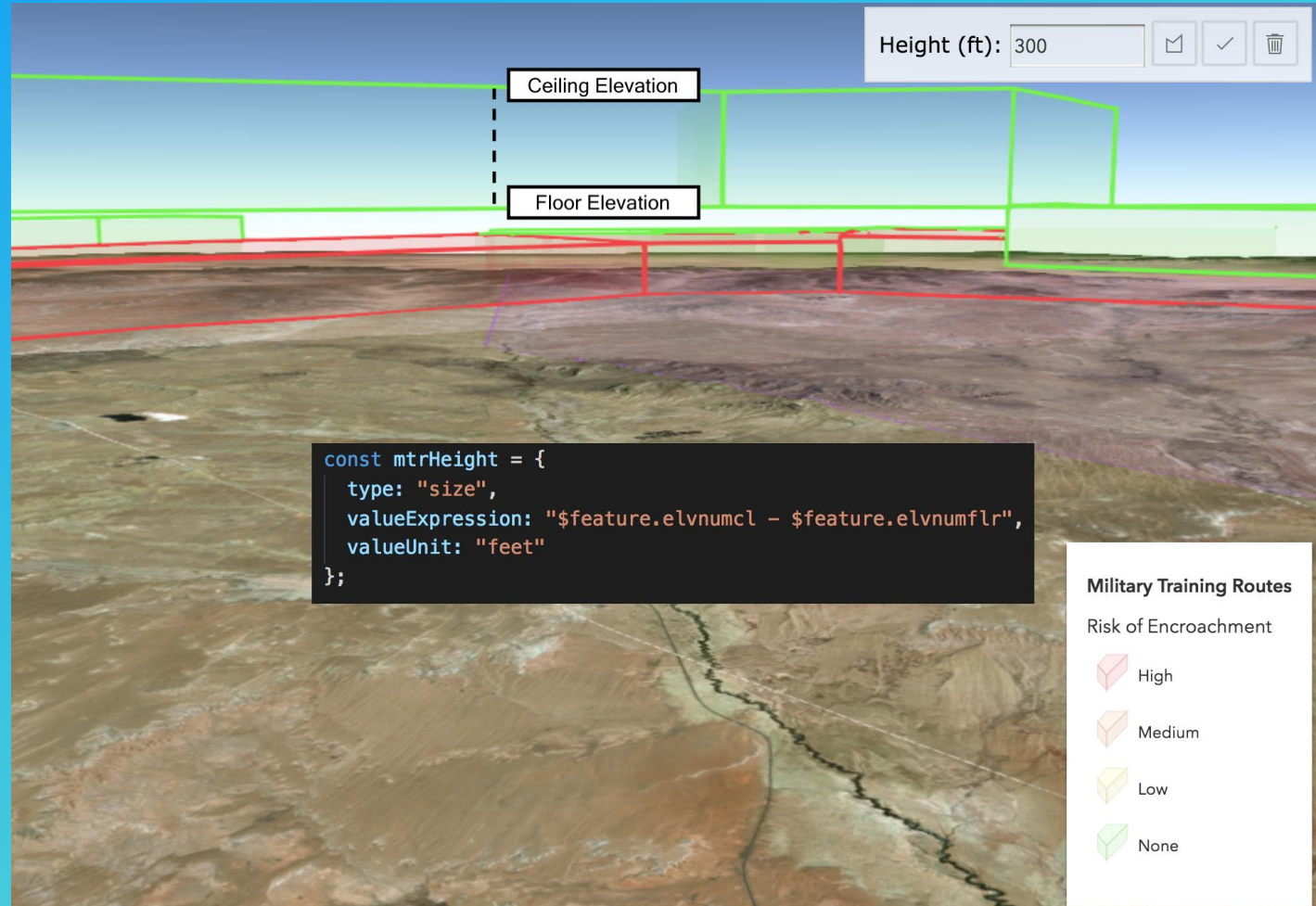
Military Training Routes

Real world size

Using data attributes to size features based on real world size.

```
const mtrHeight = {
  type: "size",
  valueExpression: "$feature.elvnumcl - $feature.elvnumflr",
  valueUnit: "feet"
};

const initialRenderer = {
  type: "simple",
  symbol: {
    type: "polygon-3d",
    symbolLayers: [{
      type: "extrude",
      material: {
        color: [255,255,255,0]
      },
      edges: {
        type: "solid",
        color: "#2b7bff",
        size: 1.25
      }
    }
  ]
},
  visualVariables: [ mtrHeight ]
};
```



Elevation offsets

Height (ft): 300

Ceiling Elevation

Floor Elevation

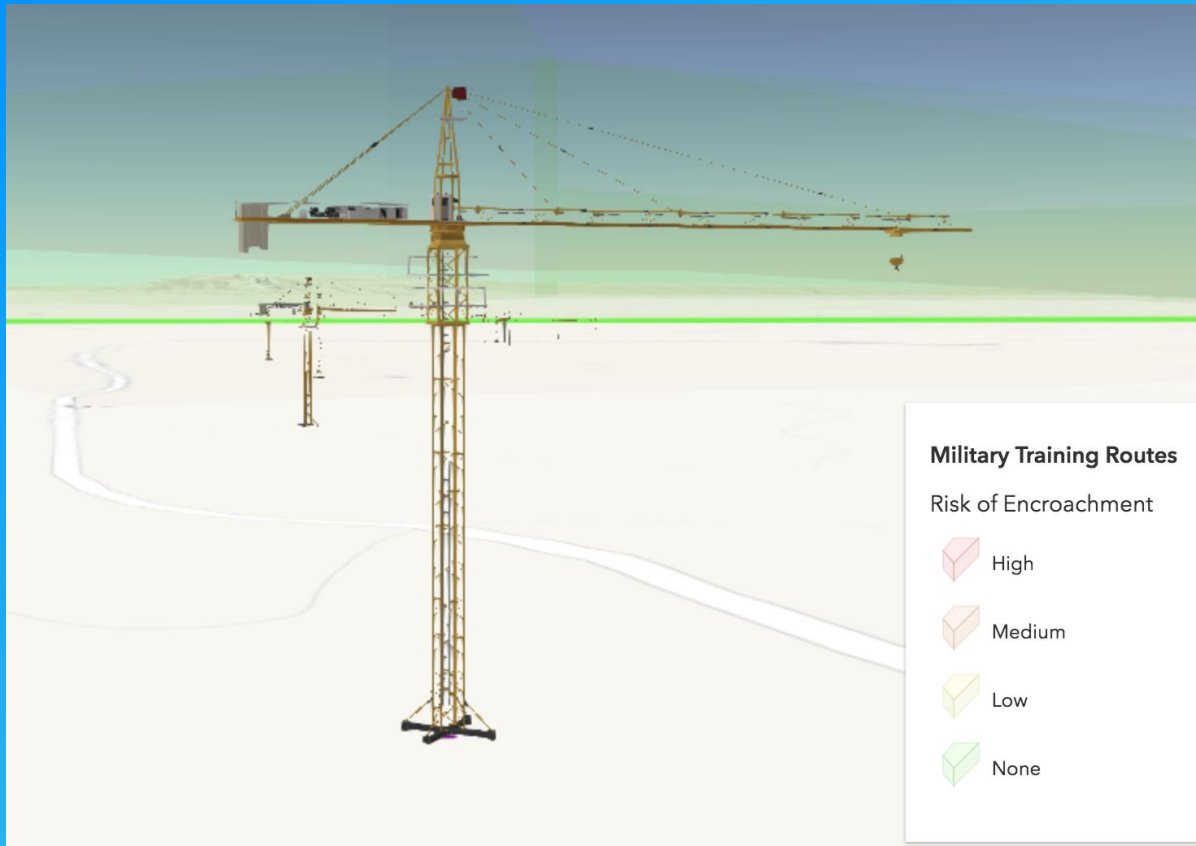
```
layer.elevationInfo = {  
  mode: "relative-to-ground",  
  featureExpressionInfo: {  
    expression: "$feature.elvnumflr"  
  },  
  unit: "feet"  
}
```

Military Training Routes
Risk of Encroachment

- High
- Medium
- Low
- None

Realistic symbols

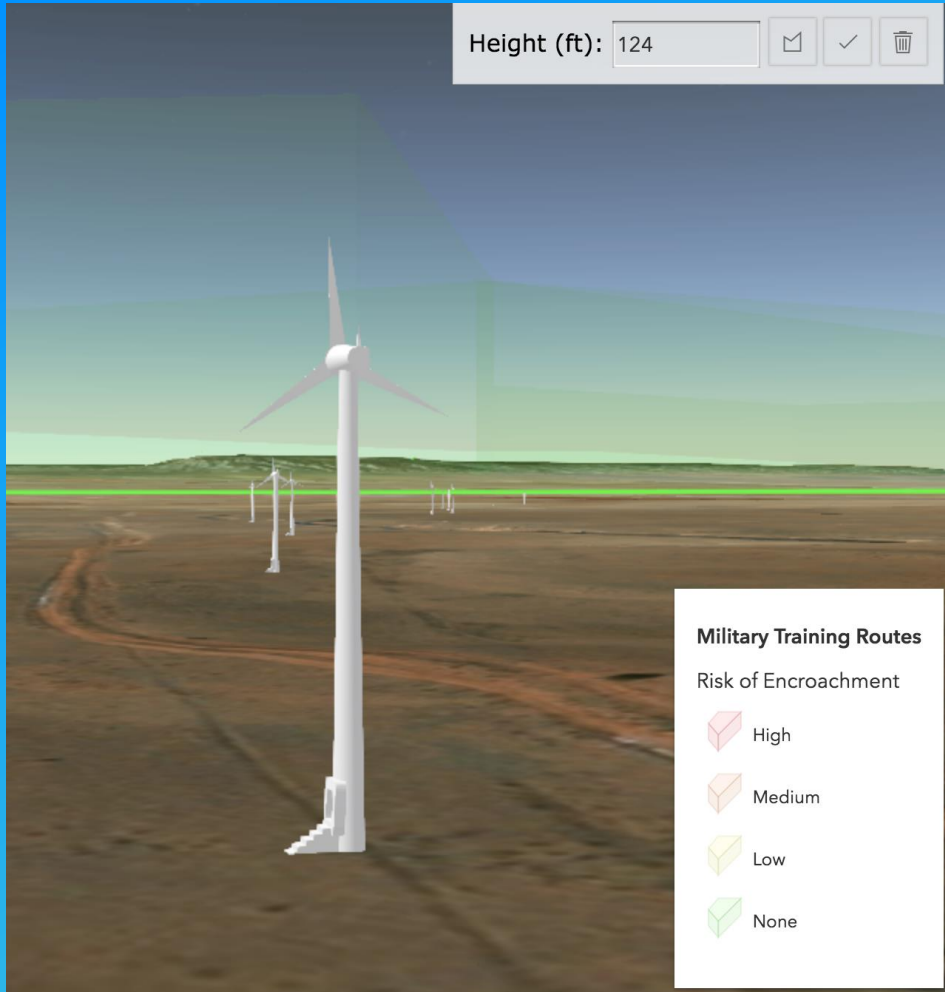
aka Web Styles...



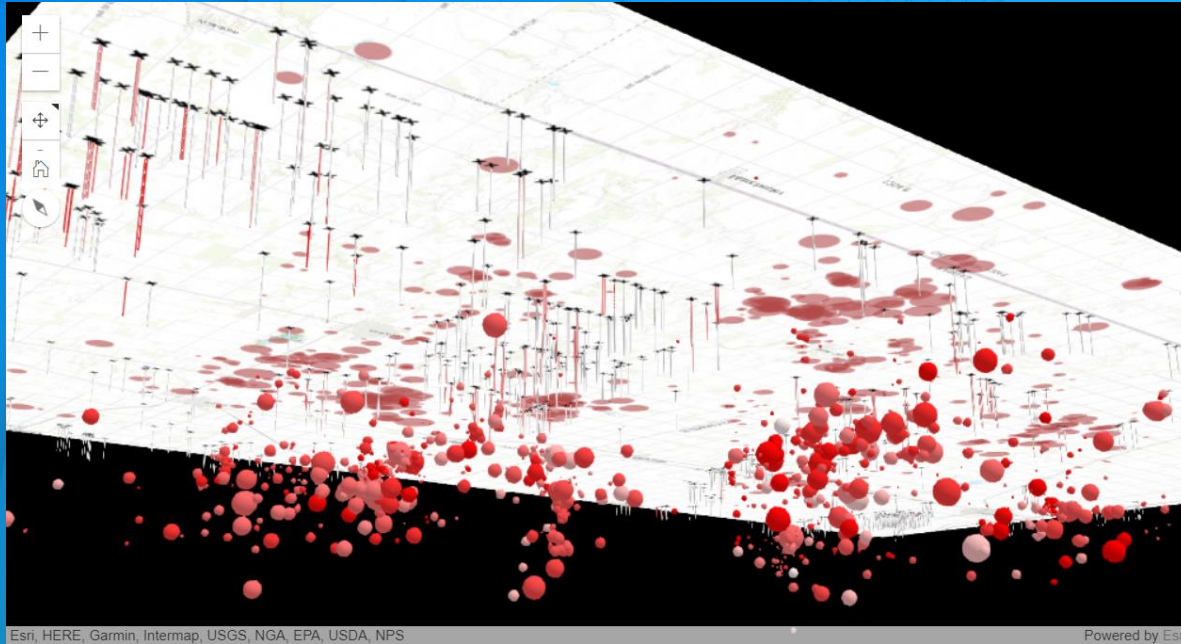
```
const craneRenderer = {  
  type: "simple",  
  symbol: {  
    type: "web-style",  
    name: "Tower_Crane",  
    styleName: "EsriRealisticTransportationStyle"  
  },  
  visualVariables: [{  
    type: "size",  
    field: "total_ht",  
    axis: "height",  
    valueUnit: "feet"  
  }]  
};
```

Realistic symbols

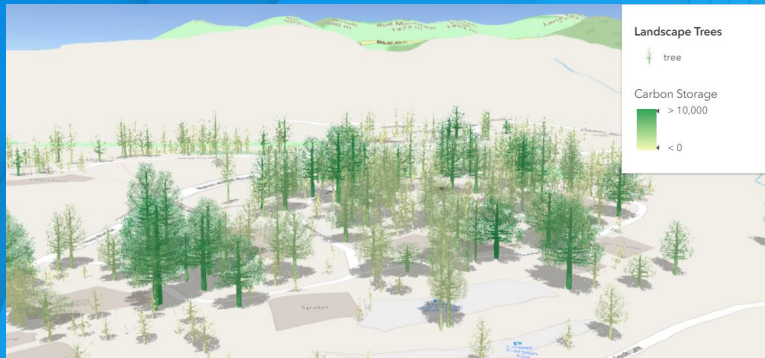
Web Styles published from ArcGIS Pro



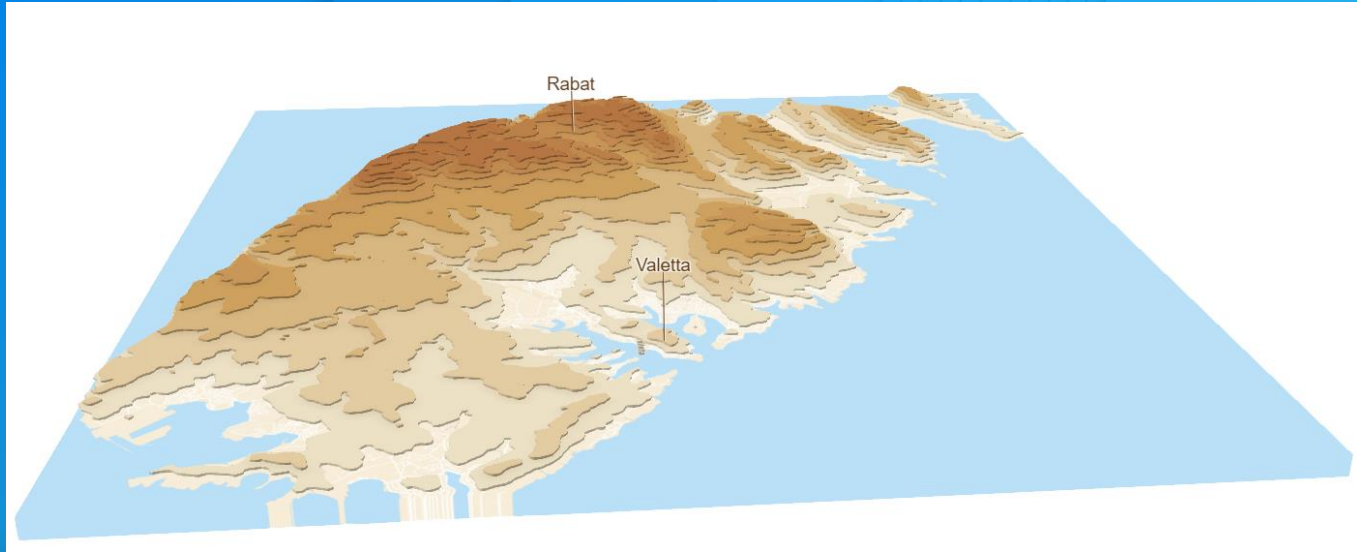
```
const turbineRenderer = {  
  type: "simple",  
  symbol: {  
    type: "web-style",  
    styleUrl: "https://www.arcgis.com/sharing/rest/...",  
    name: "Turbines"  
  },  
  visualVariables: [{  
    type: "size",  
    field: "total_ht",  
    axis: "height",  
    valueUnit: "feet"  
  }]  
};
```



Underground visualization



Documentation samples



Terrain visualization

Using contour lines

Resources

ArcGIS API for JavaScript SDK samples:

<https://developers.arcgis.com/javascript/latest/sample-code/index.html?search=webstyle>

Making the leap to 3D - <http://www.esri.com/esri-news/arcuser/fall-2017/making-the-leap-to-web-3d> (ArcUser article)

Hiking app – <https://github.com/RalucaNicola/hiking-app>

Airspace encroachment analysis app –

<https://github.com/ekenes/conferences/tree/master/ds-2018/3d-viz-2d-data/demos/mtr>



esri

THE
SCIENCE
OF
WHERE