# Smart Cities Hackathon
# Tier 1 Challenge 1

## Tier 1 Challenge 1: Create a virtual sensor for the other challenges

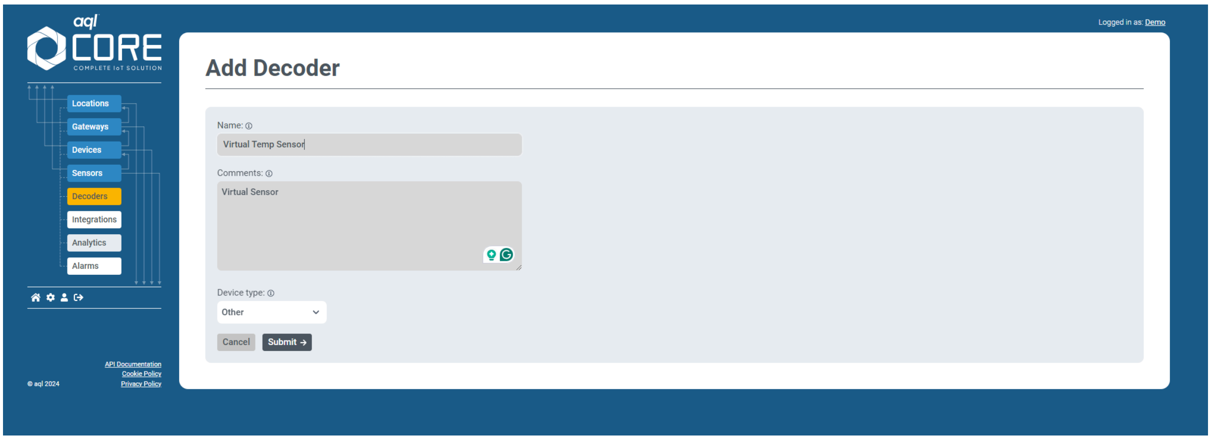
This challenge will see you create a virtual sensor for core.aql.com. This will allow you to upload readings via the API and via MQTT to simulate readings. We will use this sensor for other Tier 2 and Tier 3 Challenges.  This challenge will allow you to learn about https://core.aql.com end to end, so you have the knowledge and skills to complete and build upon the other challenges. Good luck and enjoy.

Step 1

Log into the aql Core IoT platform (https://core.aql.com/login) with your provided event credentials.

Step 2

Select the decoders option from the left-hand menu. Select “Add Decoder”. Enter a name for your virtual sensor using your team name and type of sensor. For example Team1-Temp-Virtual Sensor. Enter a comment and select the type as “Other”.



Add Decoder

Name: Virtual Temp Sensor

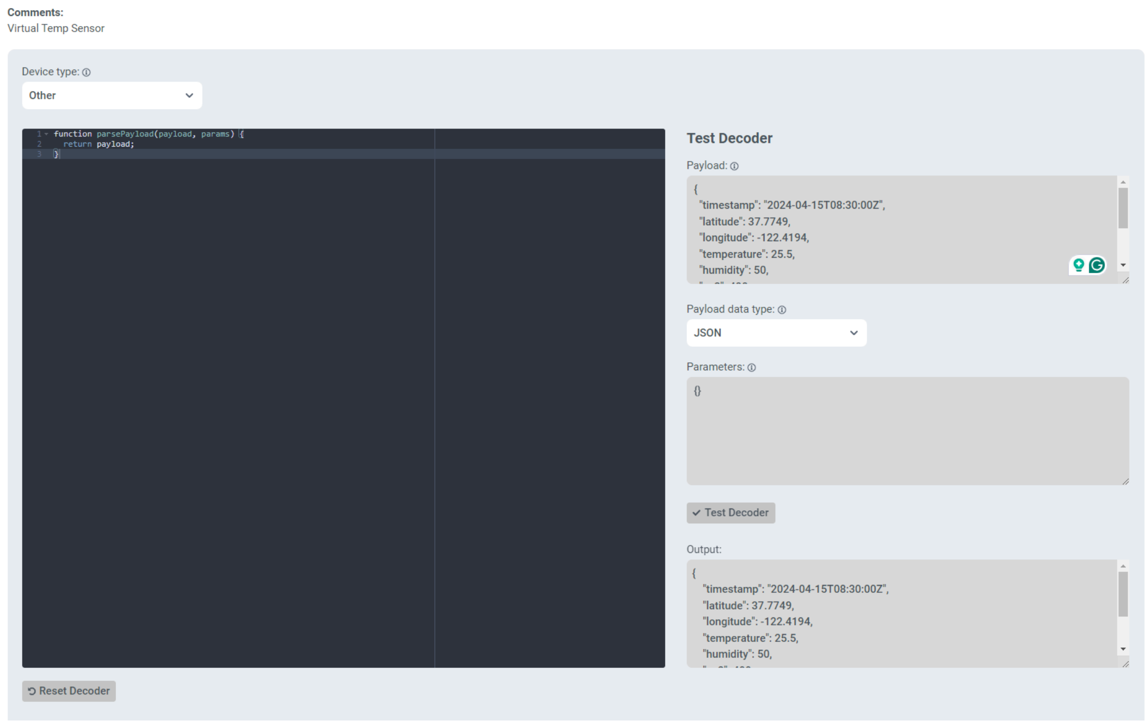
Comments: Virtual Sensor

Device type: Other

Step 3

The decoder page allows you to create complex logic to parse sensor readings. Sensor readings are normally returned as a byte array. In this example, we are going to build a JSON object of any sensor reading. This is a good task for the AI Assistant, you can ask it to create a JSON object for a virtual sensor, below is an example of a starter JSON object

```
{
  "timestamp": "2024-04-15T08:30:00Z",
  "latitude": 37.7749,
  "longitude": -122.4194,
  "temperature": 25.5,
  "humidity": 50,
  "co2": 400,
  "pm25": 10,
  "pm10": 20
}
```



Comments:
Virtual Temp Sensor

Device type: Other

```
function parsePayload(payload, params) {
  return payload;
}
```

Test Decoder

Payload:

```
{
  "timestamp": "2024-04-15T08:30:00Z",
  "latitude": 37.7749,
  "longitude": -122.4194,
  "temperature": 25.5,
  "humidity": 50,
```

Payload data type: JSON

Parameters:

```
{}
```

Output:

```
{
  "timestamp": "2024-04-15T08:30:00Z",
  "latitude": 37.7749,
  "longitude": -122.4194,
  "temperature": 25.5,
  "humidity": 50,
```

Step 4

Select “Test Decoder” and the output should match the JSON ingest.

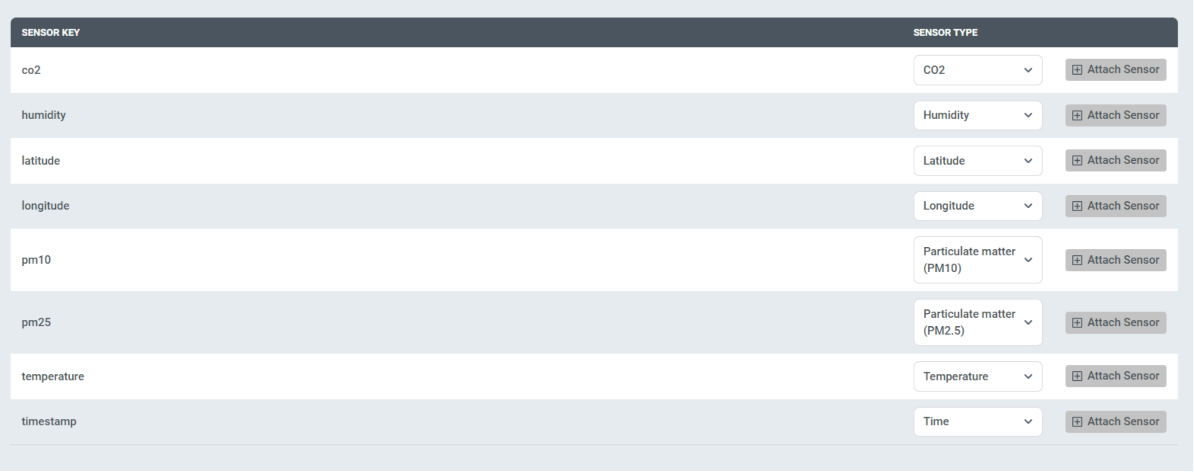
**Ways to Extend this Step**

Add your own JavaScript to add a random number or more, you can ask your AI Assistant to write some code for you. Below is a sample to add a random number called “extra”

```
function parsePayload(payload, params) {
    payload.extra = Math.random();
    return payload;
  }
```

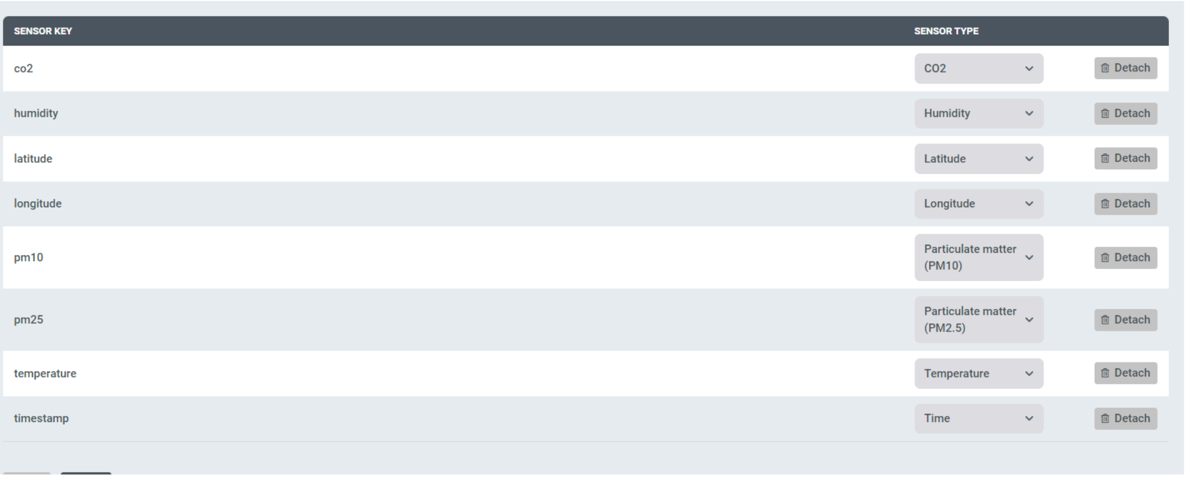
Step 5

Scroll down the page, and you will see the “Sensor Mapping” element of the page. This is where you map the JSON output to the list of supported sensors for core.aql.com. Core.aql.com will attempt to automap the key to the correct sensor. If any look incorrect, select the correct sensor from the sensor dropdown.



| SENSOR KEY | SENSOR TYPE | |
|---|---|---|
| co2 | CO2 | ⊞ Attach Sensor |
| humidity | Humidity | ⊞ Attach Sensor |
| latitude | Latitude | ⊞ Attach Sensor |
| longitude | Longitude | ⊞ Attach Sensor |
| pm10 | Particulate matter (PM10) | ⊞ Attach Sensor |
| pm25 | Particulate matter (PM2.5) | ⊞ Attach Sensor |
| temperature | Temperature | ⊞ Attach Sensor |
| timestamp | Time | ⊞ Attach Sensor |

Once you are happy with the key and the sensor type select “Attach Sensor”.



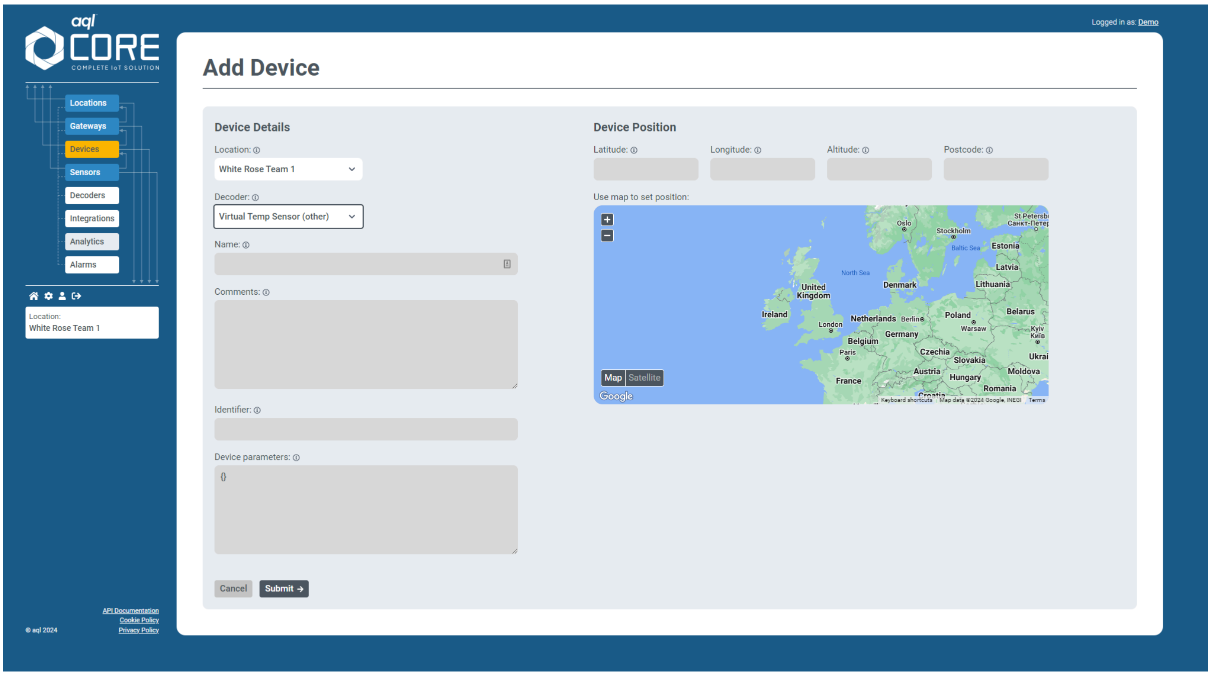
| SENSOR KEY | SENSOR TYPE | |
|---|---|---|
| co2 | CO2 | Detach |
| humidity | Humidity | Detach |
| latitude | Latitude | Detach |
| longitude | Longitude | Detach |
| pm10 | Particulate matter (PM10) | Detach |
| pm25 | Particulate matter (PM2.5) | Detach |
| temperature | Temperature | Detach |
| timestamp | Time | Detach |

Once you have attached all the sensors finally hit the SAVE button.

Step 6

Next, select devices from the left-hand menu. Select your team from the location dropdown, and select “Add Device”.

Step 7



Location:
White Rose Team 1

Add Device

Device Details

Location: White Rose Team 1

Decoder: Virtual Temp Sensor (other)

Name:

Comments:

Identifier:

Device parameters:
{}

Cancel Submit →

Device Position

Latitude: Longitude: Altitude: Postcode:

Use map to set position:

Select your newly created decoder from the dropdown menu, then enter a name and comment that describes your virtual device.

Enter a unique identifier. You can then assign some device parameters; these are JSON objects that you can use within the decoder that have device specific parameters that the sensor doesn't return. For example,

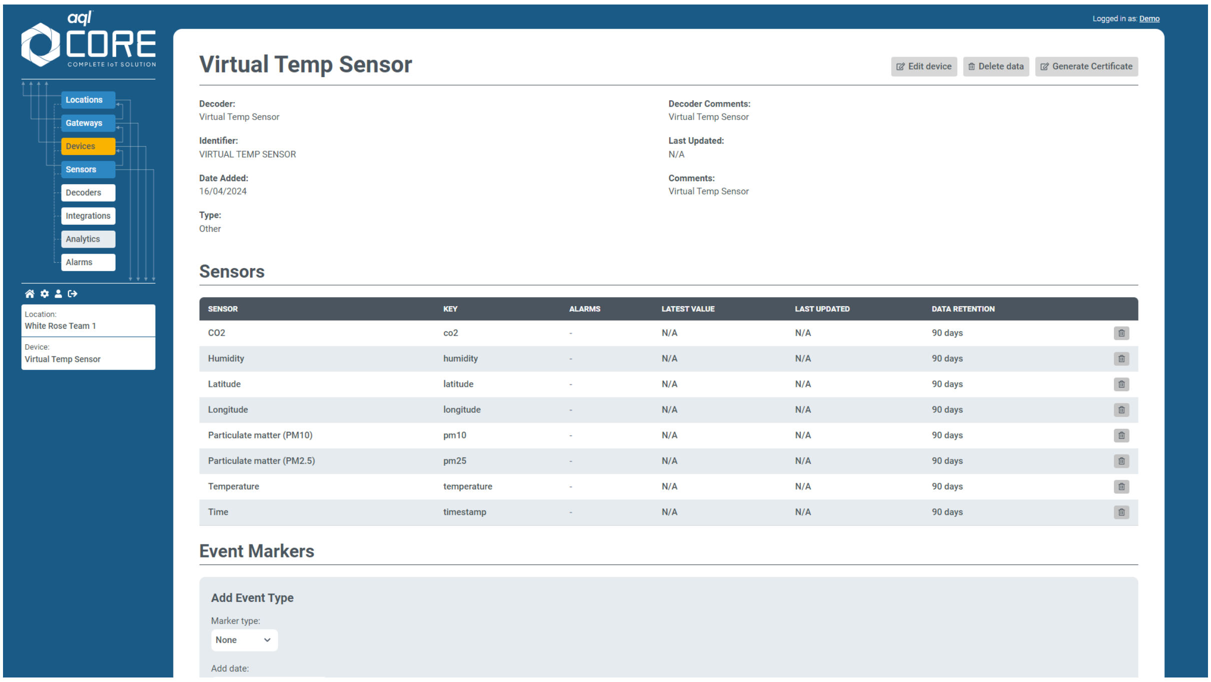
```
{
  "tag1" : 1,
  "tag2" :2
}
```

Next enter the GPS locations for today's event. If you aren't sure you can ask your Tier 1 AI Assistant for these details.

Finally, select Save and your new device is ready to test

You will now see your new virtual device, with all the sensors we created in the earlier decoder.

If you add further sensors to your decoder, these will appear automatically when the initial reading is uploaded.



Location:
White Rose Team 1

Device:
Virtual Temp Sensor

## Virtual Temp Sensor

**Decoder:**
Virtual Temp Sensor

**Decoder Comments:**
Virtual Temp Sensor

**Identifier:**
VIRTUAL TEMP SENSOR

**Last Updated:**
N/A

**Date Added:**
16/04/2024

**Comments:**
Virtual Temp Sensor

**Type:**
Other

### Sensors

| SENSOR | KEY | ALARMS | LATEST VALUE | LAST UPDATED | DATA RETENTION | |
|---|---|---|---|---|---|---|
| CO2 | co2 | - | N/A | N/A | 90 days | 🗑 |
| Humidity | humidity | - | N/A | N/A | 90 days | 🗑 |
| Latitude | latitude | - | N/A | N/A | 90 days | 🗑 |
| Longitude | longitude | - | N/A | N/A | 90 days | 🗑 |
| Particulate matter (PM10) | pm10 | - | N/A | N/A | 90 days | 🗑 |
| Particulate matter (PM2.5) | pm25 | - | N/A | N/A | 90 days | 🗑 |
| Temperature | temperature | - | N/A | N/A | 90 days | 🗑 |
| Time | timestamp | - | N/A | N/A | 90 days | 🗑 |

### Event Markers

**Add Event Type**

Marker type:
None

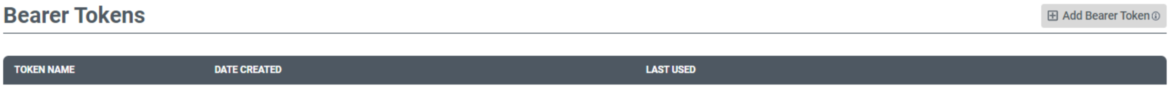
Add date:

Step 8

We are now going to create a bearer token so we can upload an initial reading. Select the settings option in the bottom left of the nav bar.

Step 9

Create a new bearer token and allocate a name for this token.



### Bearer Tokens

| TOKEN NAME | DATE CREATED | LAST USED |
|---|---|---|

Copy the token as you will need this for the JavaScript later.

Step 10

Install Postman or curl.

Curl:

https://curl.se/windows/

Postman:
https://www.postman.com/

We are going to upload a sensor reading for the newly created device. We can use this step for future challenges.

## Tier 1: Challenge 1

Replace the device ID which is included in the query string and your bearer token from earlier in the snippet below. You can upload up to 100 values with a single request.

The documentation for this request can be found at https://api.core.aql.com/doc/

```
curl --location 'https://api.core.aql.com/v1/devices/YOUR_DEVICE_ID/add-reading' \
--header 'Authorization: Bearer REPLACE WITH YOUR BEARER TOKEN' \
--header 'Accept: application/json' \
--header 'Content-Type: application/json' \
--data '{
    "readings": [
        {
            "latitude": 37.7749,
            "longitude": -122.4194,
            "temperature": 2,
            "humidity": 50,
            "co2": 400,
            "pm25": 10,
            "pm10": 20
        },
        {
            "latitude": 37.7749,
            "longitude": -122.4194,
            "temperature": 9,
            "humidity": 50,
            "co2": 400,
            "pm25": 10,
            "pm10": 20
        }
    ]
}'
```

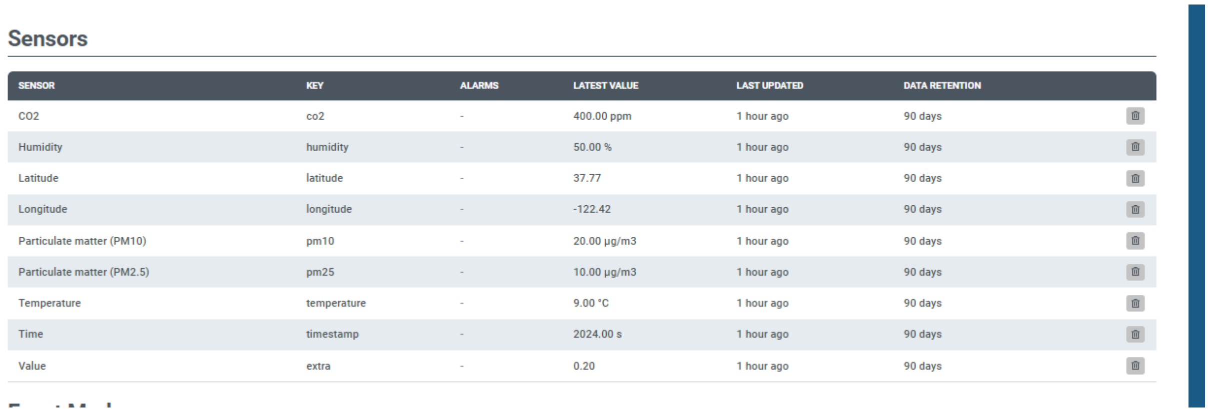
A successful submission will return a 201. If the data can be processed, a 422 will be returned.

Step 11

Navigate back to your device http://core.aql.com/devices/YOURDEVICE_ID

You will see the data frames in the logging section and the latest reading value will be displayed.

# Tier 1: Challenge 1



## Sensors

| SENSOR | KEY | ALARMS | LATEST VALUE | LAST UPDATED | DATA RETENTION | |
|---|---|---|---|---|---|---|
| CO2 | co2 | - | 400.00 ppm | 1 hour ago | 90 days | 🗑 |
| Humidity | humidity | - | 50.00 % | 1 hour ago | 90 days | 🗑 |
| Latitude | latitude | - | 37.77 | 1 hour ago | 90 days | 🗑 |
| Longitude | longitude | - | -122.42 | 1 hour ago | 90 days | 🗑 |
| Particulate matter (PM10) | pm10 | - | 20.00 µg/m3 | 1 hour ago | 90 days | 🗑 |
| Particulate matter (PM2.5) | pm25 | - | 10.00 µg/m3 | 1 hour ago | 90 days | 🗑 |
| Temperature | temperature | - | 9.00 °C | 1 hour ago | 90 days | 🗑 |
| Time | timestamp | - | 2024.00 s | 1 hour ago | 90 days | 🗑 |
| Value | extra | - | 0.20 | 1 hour ago | 90 days | 🗑 |

You have now created your virtual sensor and can upload readings. Well done! You can now move on to the next challenge.