RainHound

Weather Tracker and Alerts Generator

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https://github.com/GabrielStancu/RainHound

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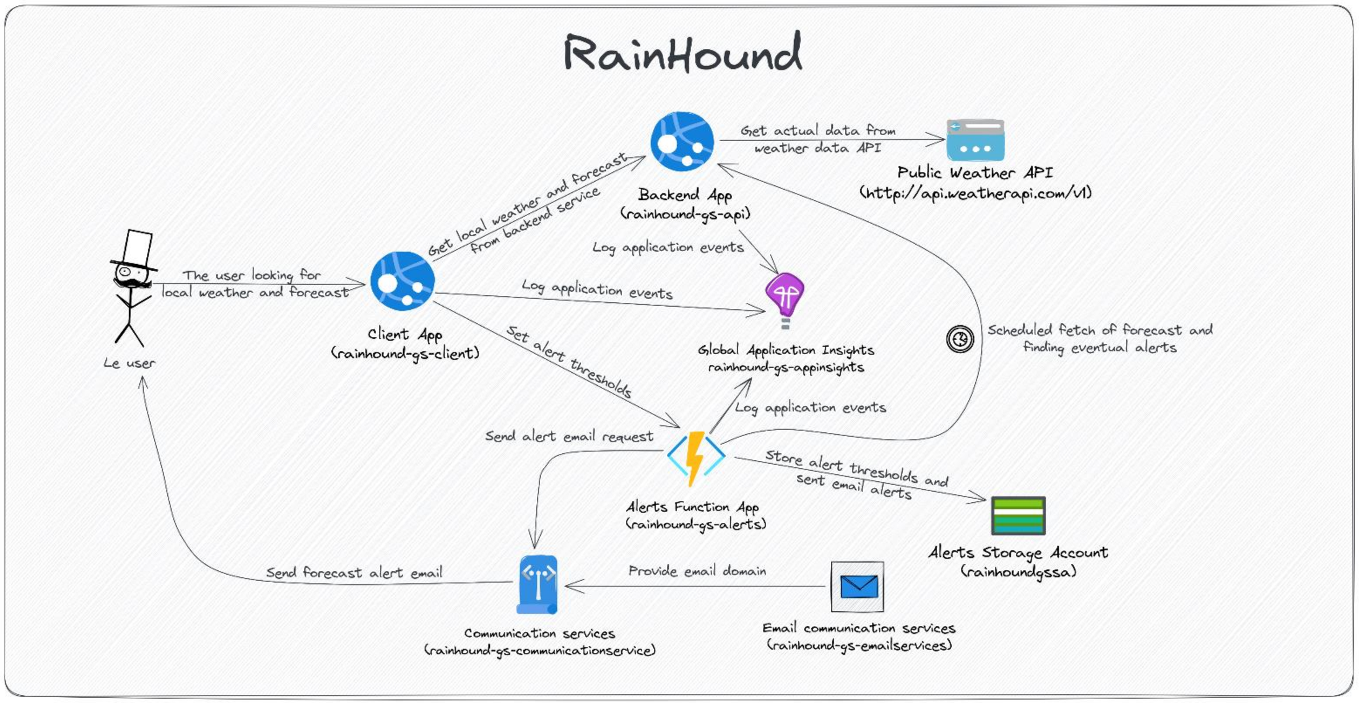
1. Introduction

RainHound is a web application used for weather tracking in real time. It is capable of fetching weather forecast for the next 3 days, with the possibility of sending email alerts in case certain events happen:

- Temperature goes below a preset threshold
- Temperature goes above a preset threshold
- Rain chances going above a preset threshold

2. Architecture

The application was built using the following architecture:

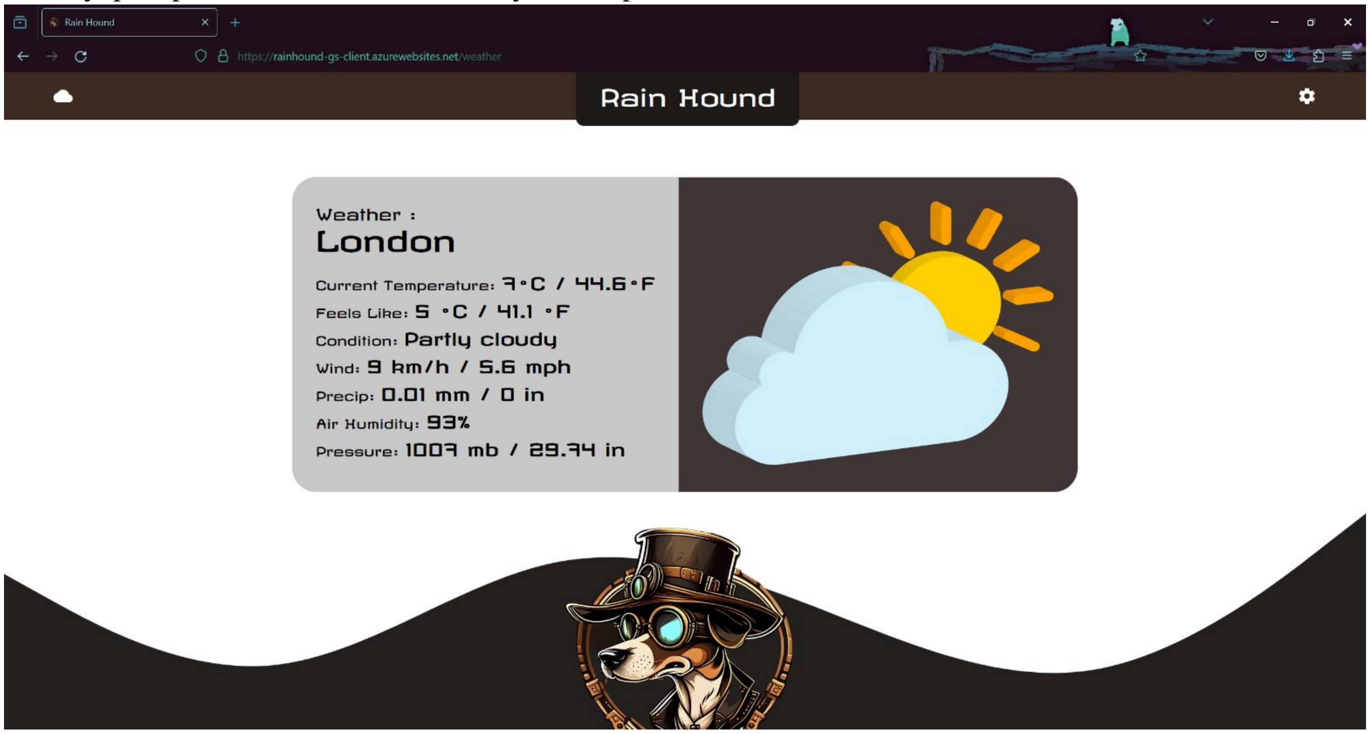


RainHound
Get actual data from weather data API
Public Weather API (http://api.weatherapi.com/v1)
Backend App (rainhound-gs-api)
Get local weather and forecast from backend service
The user looking for local weather and forecast
Le user
Client App (rainhound-gs-client)
Log application events
Log application events
Global Application Insights rainhound-gs-appinsights
Set alert thresholds
Scheduled fetch of forecast and finding eventual alerts
Log application events
Send alert email request
Store alert thresholds and sent email alerts
Alerts Function App (rainhound-gs-alerts)
Alerts Storage Account (rainhoundgssa)
Send forecast alert email
Provide email domain
Communication services (rainhound-gs-communicationservice)
Email communication services (rainhound-gs-emailservices)

- **Client App (Web App):** Angular SPA application, allowing user to track weather in the desired location, obtaining forecast data, setting alert thresholds
- **Backend App (Web App)**: .NET 7 Web API, responsible for fetching data from the public weather API
- **Alerts Function App (Function App)**: .NET 7 Function App, responsible for storing the alerts set by the user and running periodically (every hour) a forecast check to search for new alerts
- **Alerts Storage Account**: Storage Account, the table storage is used for storing the alert thresholds and the send email alerts (to avoid duplicate emails every hour)
- **Global Application Insights**: Application Insights instance where all the logs from the first 3 components are sent
- **Email communication service**: provides an email domain used for sending the alerts to the users
- **Communication services**: uses the provided email domain to send the detected alerts to the users

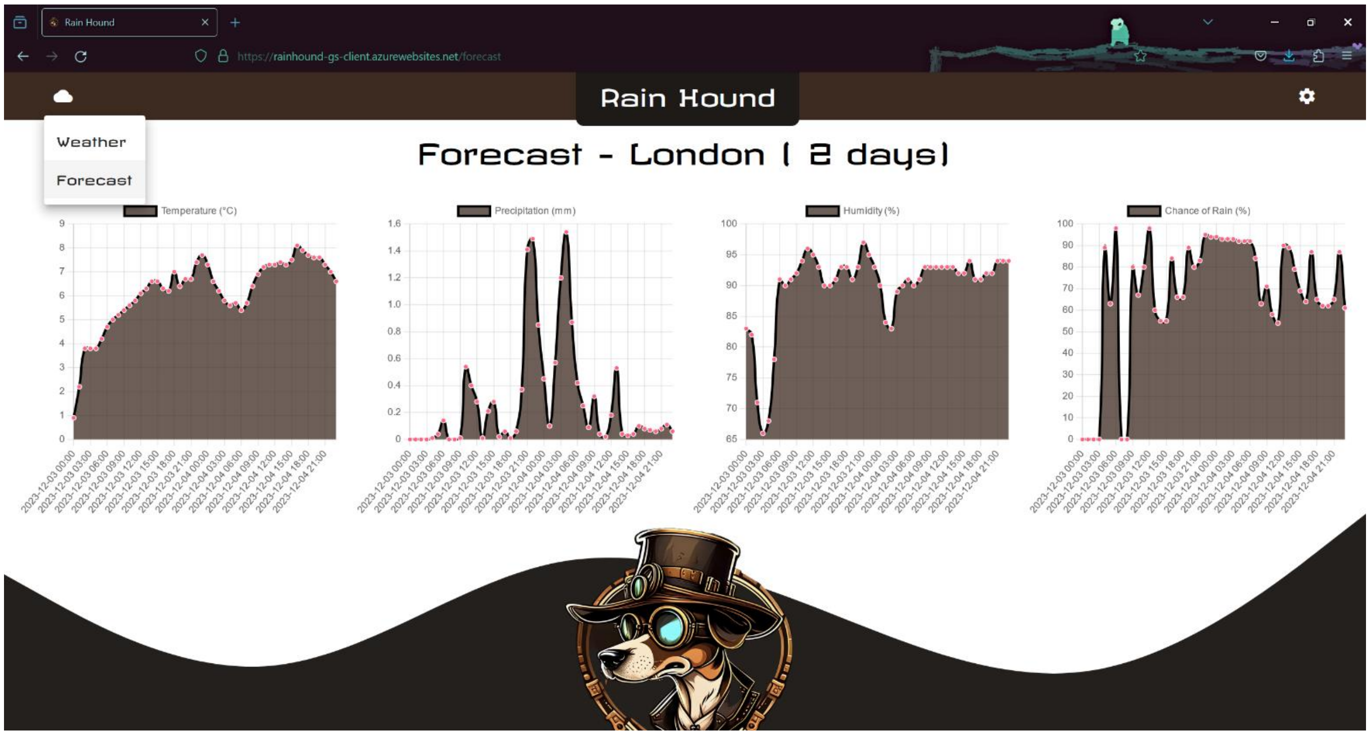
3. User manual

The user goes to https://rainhound-gs-client.azurewebsites.net which will redirect the user to https://rainhound-gs-client.azurewebsites.net/weather. By default, the London weather is displayed. Displayed data consists of current temperature, how the temperature feels like, condition (assisted by a suggestive image), wind velocity, precipitations volume, air humidity and air pressure.

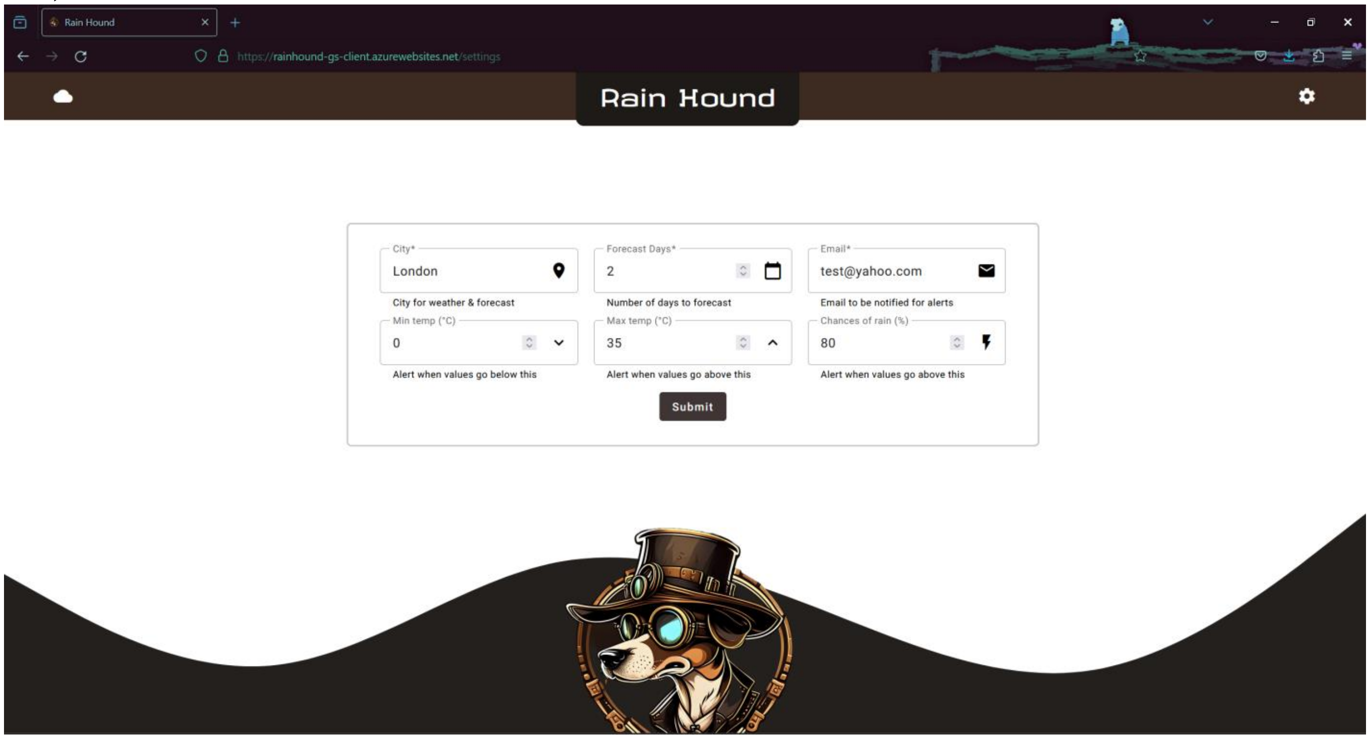


Weather :
London
Current Temperature: 7°C / 44.6°F
Feels Like: 5 °C / 41.1 °F
Condition: Partly cloudy
Wind: 9 km/h / 5.6 mph
Precip: 0.01 mm / 0 in
Air Humidity: 93%
Pressure: 1007 mb / 29.74 in

The user can change the view and see forecast data by clicking the cloud icon in the navbar:



Here the user sees the temperature, precipitations volume, humidity and chances of rain for the next few days. To configure the city, alert thresholds (minimum/maximum temperature, minimum precipitations chances), the email to be alerted at and the number of days for the forecast data, the user clicks the gear icon on the navbar. The form is validated (required values, minimum temperature should be blow the high temperature, maximum 3 days for forecast data):

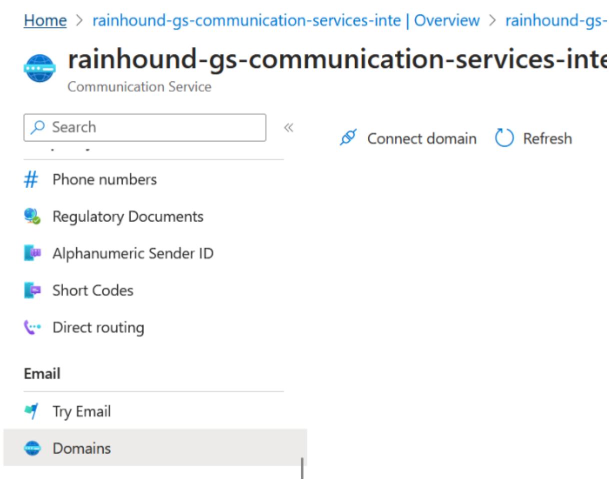


City*: London	Forecast Days*: 2	Email*: test@yahoo.com
City for weather & forecast	Number of days to forecast	Email to be notified for alerts
Min temp (°C): 0	Max temp (°C): 35	Chances of rain (%): 80
Alert when values go below this	Alert when values go above this	Alert when values go above this

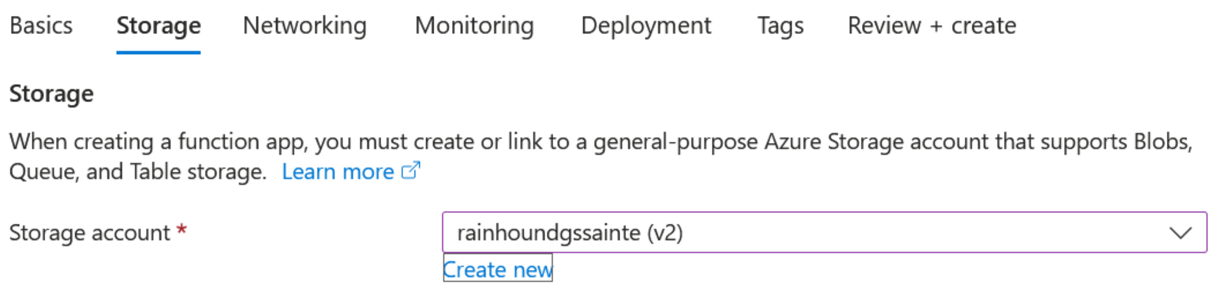
4. Deployment

The deployment is done using a CI/CD pipeline built on GitHub actions. The integration environment deploy is triggered by any push on the **integration** branch, while the production environment is triggered by any push on the **master** branch. The actions files (see under github/workflows in the repository) contain descriptive comments for each task/instruction. The following steps were taken for initializing the resources in Azure (screenshots taken from integration, the same steps were applied in production):

1. Create AppInsights instance
2. Create Email Communication Services
    a. Add Azure/Custom domain to it
3. Create Communication Services
    a. Connect email domain from step 2a



4. Create storage account
    a. Create Alerts & Emails tables
5. Create Function App
    a. Use the storage account from step 4

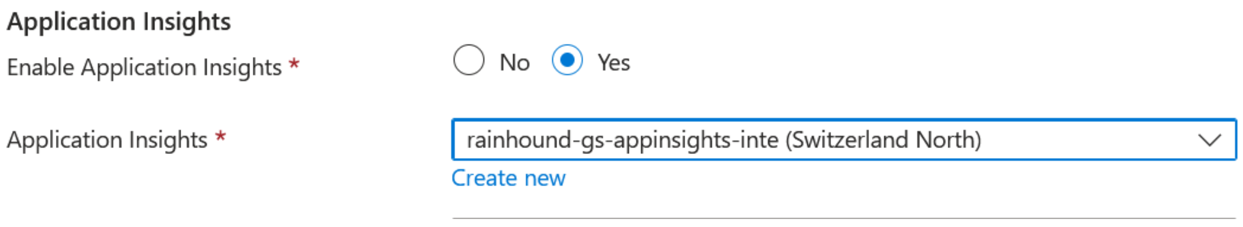


Storage

When creating a function app, you must create or link to a general-purpose Azure Storage account that supports Blobs, Queue, and Table storage.

Storage account * rainhoundgssainte (v2)

    b. Use Application Insights from step 1



Application Insights

Enable Application Insights * No [✓ Yes]

Application Insights * rainhound-gs-appinsights-inte (Switzerland North)

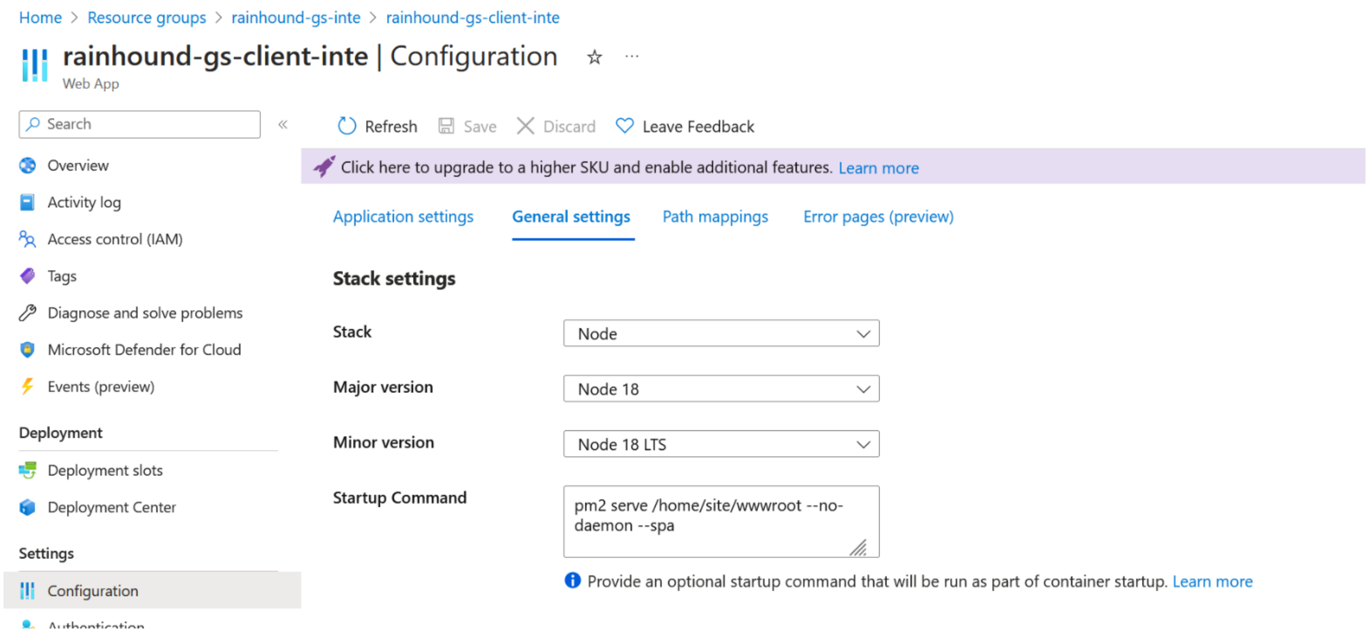
c. Set other configurations in Configuration -> Application Settings

```
  "Values": {
    "AzureWebJobsStorage": "connection string of storage account from step 4",
    "FUNCTIONS_WORKER_RUNTIME": "dotnet-isolated",

    "Alerts:ScheduleCron": "0 0 * * * *",
    "Alerts:FromEmail": "email domain from steps 2 & 3",
    "Alerts:Subject": "Weather Alert",
    "Alerts:ConnectionString": "connection string of communication services from step
2"
    "TableStorage:ConnectionString": "connection string of storage account from step
4",
    "TableStorage:AlertsTable": "Alerts",
    "TableStorage:EmailsTable": "Emails",

    "WeatherApi:Url": "url of weather api"
  },
```

9. Create web app for frontend application.
   a. Connect the Web App to the Application Insights instance from step 1
   b. Set startup command in Configuration -> General settings:



Click here to upgrade to a higher SKU and enable additional features. Learn more

Stack settings

Stack: Node
Major version: Node 18
Minor version: Node 18 LTS
Startup Command: pm2 serve /home/site/wwwroot --no-daemon --spa

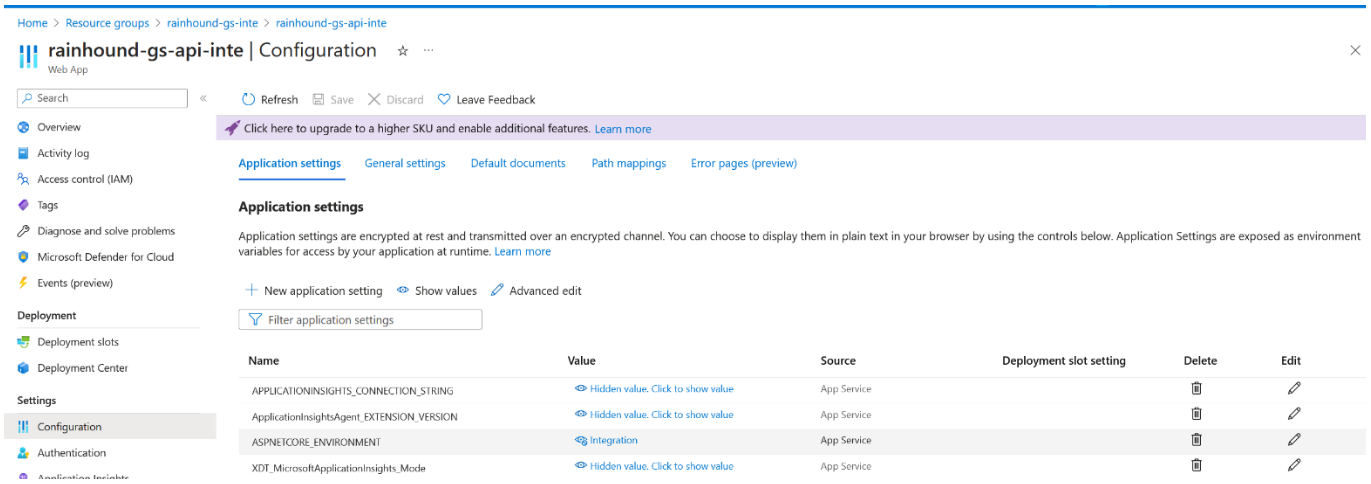
Provide an optional startup command that will be run as part of container startup. Learn more

(step taken from this article: https://nicolgit.github.io/how-deploy-angular-app-to-azure-appservice-running-linux-from-github/)

pm2 serve /home/site/wwwroot --no-daemon –spa

10. Create web app for backend application.
   a. Connect the Web Application to the Application Insights instance from step 1

b. Set environment in Configuration:



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rainhound-gs-api-inte | Configuration

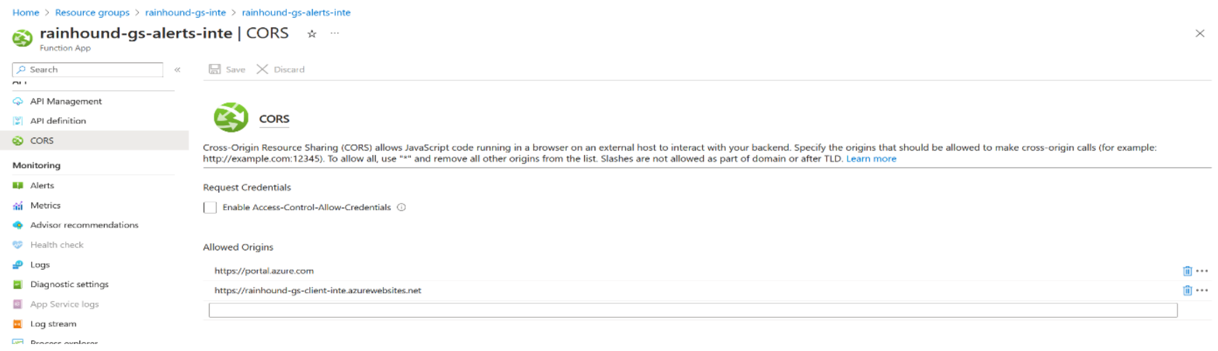
Web App

Application settings are encrypted at rest and transmitted over an encrypted channel. You can choose to display them in plain text in your browser by using the controls below. Application Settings are exposed as environment variables for access by your application at runtime. Learn more

Name	Value	Source	Deployment slot setting
APPLICATIONINSIGHTS_CONNECTION_STRING	Hidden value. Click to show value	App Service	
ApplicationInsightsAgent_EXTENSION_VERSION	Hidden value. Click to show value	App Service	
ASPNETCORE_ENVIRONMENT	Integration	App Service	
XDT_MicrosoftApplicationInsights_Mode	Hidden value. Click to show value	App Service	

ASPNETCORE_ENVIRONMENT : Integration / Production

11. Set CORS for function app to allow calls from client app:



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rainhound-gs-alerts-inte | CORS

Function App

CORS

Cross-Origin Resource Sharing (CORS) allows JavaScript code running in a browser on an external host to interact with your backend. Specify the origins that should be allowed to make cross-origin calls (for example: http://example.com:12345). To allow all, use "*" and remove all other origins from the list. Slashes are not allowed as part of domain or after TLD. Learn more

Request Credentials

☐ Enable Access-Control-Allow-Credentials

Allowed Origins

https://portal.azure.com

https://rainhound-gs-client-inte.azurewebsites.net

5. Important notions

- Make use of environments in Angular application:
    - Run **ng g environments** in terminal
    - Create the **environment.development.ts**, **environment.integration.ts** and **environment.ts** files, then complete the configurations for each environment:

```
export const environment = {
  production: false,
  weatherUrl: 'base api url for backend application',
  alertsUrl: 'base api url for setting alerts function',
  setAlertEndpoint: 'SetAlert', // The name of the alert setting function
  appInsightsInstrumentationKey: 'instrumentation key for app insights, step 1',
  environment: 'Development' // or Integration or Production
};
```

    - Inside **angular.json**, under **build/configurations**:

```
            "development": {
              "buildOptimizer": false,
              "optimization": false,
              "vendorChunk": true,
              "extractLicenses": false,
              "sourceMap": true,
              "namedChunks": true,
              "fileReplacements": [
                {
                  "replace": "src/environments/environment.ts",
                  "with": "src/environments/environment.development.ts"
                }
              ]
            },
            "integration": {
              "buildOptimizer": false,
              "optimization": false,
              "vendorChunk": true,
              "extractLicenses": false,
              "sourceMap": true,
              "namedChunks": true,
              "fileReplacements": [
                {
                  "replace": "src/environments/environment.ts",
                  "with": "src/environments/environment.integration.ts"
                }
              ]
            }
```

- Inside **angular.json**, under **serve/configurations**:

```
        "serve": {
          "builder": "@angular-devkit/build-angular:dev-server",
          "configurations": {
            "production": {
              "browserTarget": "client:build:production"
            },
            "development": {
              "browserTarget": "client:build:development"
            },
            "integration": {
              "browserTarget": "client:build:integration"
            }
          },
          "defaultConfiguration": "development"
        },
```

- Inside **package.json**, under **scripts**: (these will map the **npm run build:environment** to the Angular CLI instruction for building with the desired configuration):

```
  "scripts": {
    "ng": "ng",
    "start": "ng serve",
    "build": "ng build",
    "build:integration": "ng build --configuration=integration",
    "build:production": "ng build --configuration=production",
    "watch": "ng build --watch --configuration development",
    "test": "ng test"
  },
```

- Make use of configurations in backend API:
  - Complete the **appsettings.Development.json**, **appsettings.Development.json**, or **appsettings.Development.json** file with the required configurations:

```
{
  "Logging": {
    "LogLevel": {
      "Default": "Information",
      "Microsoft.AspNetCore": "Warning"
    }
  },
  "WeatherApi": {
    "BaseUrl": "base api url for weather external service",
    "ApiKey": "key for external weather api",
    "CacheDurationMinutes": 60
  },
  "Environment": {
    "Name": "Integration"
  },
  "Client": {
    "BaseUrl": "base url for client, used for CORS"
  },
  "AlertsFunction": {
    "BaseUrl": "base url for function app, used for CORS"
  }
}
```

- Make use of configurations in function app: manually set the application settings in each environment, directly in Azure. See 4.5.c.

6. Future improvements

As of future improvements, the next features would be added:

- Allow user to unsubscribe from alerts for given city and thresholds
- Make the application responsive (mobile-friendly)
- Move the backend to Docker container, deploy as Container Registry + Container Instance (integration) and Container Apps (production)
- Send SMS instead of emails (for better reach)
- Move credentials to encrypted services, remove the configuration files from project and Git