# Mobile Computing Report

WeatherGetWeb

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## 1. About the project

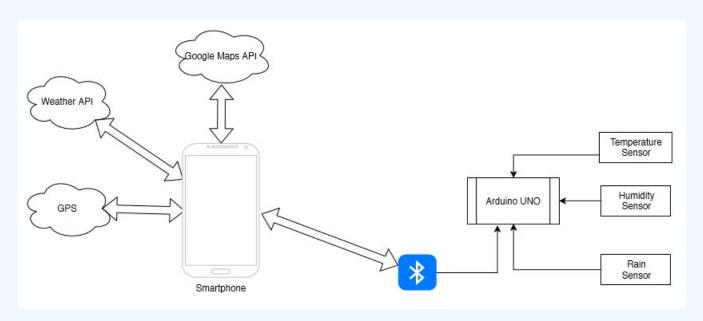
My project is about obtaining real time weather forecast using two kind of sources (Web and Arduino microcontroller) and two API services.

The location data (latitude,longitude) can be retrieved by GPS or by a Google Maps API: <a href="https://maps.googleapis.com/maps/api/geocode/json?address=Craiova.+Romania&key=AlzaSyBnxx\_P3fB-7V1ViyvtiCqoAMeZXiZjyRE">https://maps.googleapis.com/maps/api/geocode/json?address=Craiova.+Romania&key=AlzaSyBnxx\_P3fB-7V1ViyvtiCqoAMeZXiZjyRE</a>

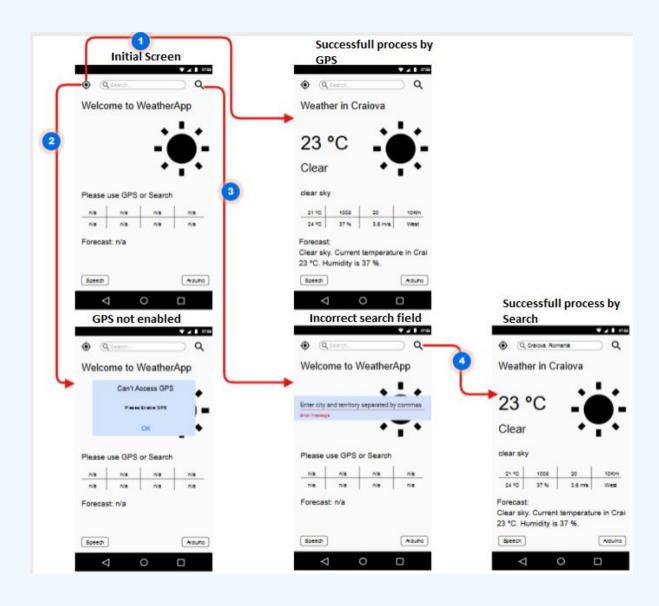
The weather data is retrieved by the following API: <a href="http://api.openweathermap.org/data/2.5/weather?lat=44.32308&lon=23.8103&appid=d5bfbd6d08ee736dad9dd034b772665b">http://api.openweathermap.org/data/2.5/weather?lat=44.32308&lon=23.8103&appid=d5bfbd6d08ee736dad9dd034b772665b</a>.

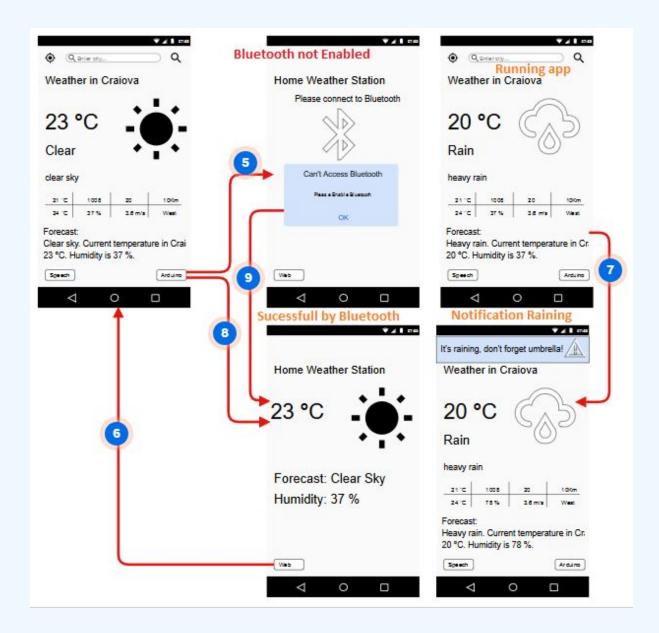
A small amount of weather data (temperature, humidity, rain status) will be retrieved using the microcontroller Arduino UNO along with the respective sensors. The connection between smartphone and Arduino is made by Bluetooth. The purpose of embedded system usage is for more trustable weather info, when user is at home.

### Devices block diagram:



# 2. Application wireframe

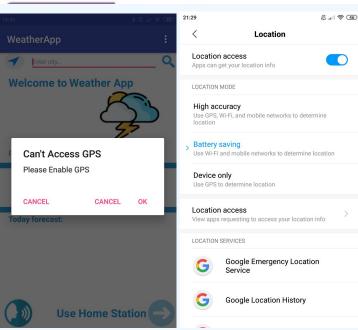




Arrow 1: When GPS button it's pressed application launches the built-in GPS in order to receive the latitude and longitude. The Weather API call will include this location information in order to retrieve the weather data and display on application.

Arrow 2: When GPS button it's pressed but GPS is not enabled, an error window pops up. By clicking 'OK', user will be driven to the location settings in order to enable GPS.





Arrow 3: When Search button is pressed, but textbox fields is not filled or has incorrect format, a helper message pops up.

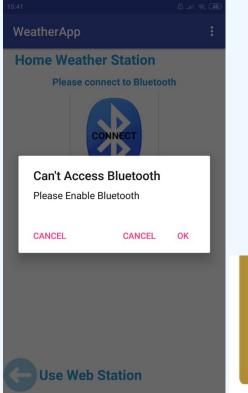


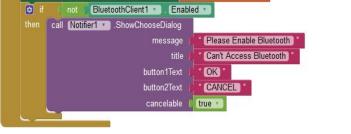
Arrow 4: When Search button it's pressed and preconditions are fulfilled, a call is made to Google Maps API in order to obtain the location data for the searched city. After location is retrieved the Weather API is called and weather data is displayed.

```
SearchButton . Click
set global GPSActiveFlag to false
set global LocationComplete to CityTextBox . Text .
get global LocationComplete # *
then set global locationList to split at first text ( get global LocationComplete
            length of list list get global locationList
                                                         select list item list get global locationList
                                                                  index 1
                                                   . .
                                                   %20
                                                            select list item list get global locationList
            set global TerritoryName to
                                                                      index 2
                                                     - 8
           call getLocationData
            call Notifier1 .ShowAlert
                               Enter city and territory separated by commas
```

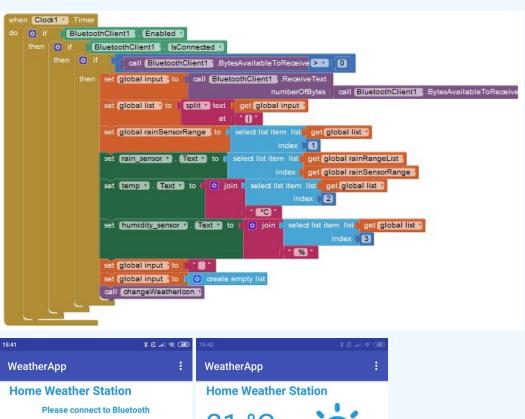
```
to getLocationData
do set global CompleteURL to pioin get global LocationURLBeginning
get global CityName
get global URLSeparation
get global TerritoryName
get global URLEnd
set Web2 Get
call Web2 Get
call Notifier1 LogInfo
message pioin LOCATIONURL
get global CompleteURL
```

Arrow 5: When Home Weather Station button it's pressed, Screen 2 it's initialized. If Bluetooth is not enabled, an error window pops up. By clicking 'OK', user will be driven to the bluetooth settings in order to enable Bluetooth.





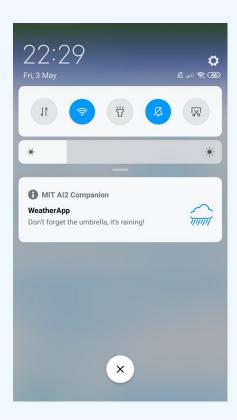
Arrow 8: When Home Weather Station button it's pressed and Bluetooth is enabled and connected to Bluetooth device, application reads the sent bytes, separates the elements by a defined separator character, and displays the info.





Arrow 6: When Web Station button it's pressed, the screen is changed to the main screen.

Arrow 7: When the forecast (either by Web or Arduino) announces rain, a popup notification will be shown, used to alert the user.



### Another processes:

- the weather image is changed according to weather forecast and day time.



- A forecast report speech can be trigger by pressing the button

```
then set WeatherPicture Picture to Night.png else set WeatherPicture Picture to Night.png else set WeatherPicture Picture to Cloudy Night.png
```

```
to changeWeatherloon
do set global HourTime to call Clock1 .Now
    if contains text get global feed
                         "Snow"
                  piece
    then set CurrentWeatherlconImage . Picture to Snow.png
    else if contains text get global feed
                         "Rain"
                  piece
    then set CurrentWeatherlconImage . Picture to Rain.png
         call TaifunNotification1 .Send
                           seconds 0
                                   WeatherApp
                                    Don't forget the umbrella, it's raining!
                                   It's raining!
         set TaifunNotification1 . (con to Rain.png
    else if contains text get global feed
                  piece "Thunderstorm"
    then set CurrentWeatherlconImage . Picture to Rain.png
         call TaifunNotification1 .Send
                           seconds 0
                               title
                                    WeatherApp
                                    It's raining!
                           startText Don't forget the umbrella, it's raining!
    else if contains text get global feed
                  piece "Clear"
    then (a) if call Clock1 . Hour
                                                         > 19
                              instant get global HourTime
         then set CurrentWeatherloonImage . Picture to Night.png
         else set CurrentWeatherlconImage . Picture to Sunny.png
    else if contains text get global feed
                         "Mist"
                  piece (
    then set CurrentWeatherlconImage . Picture to Foggy.png
    else (c) if call Clock1 ... Hour
                                                         > 19
                                     get global HourTime
                               instant
         then set CurrentWeatherlconImage . Picture . to CloudyNight.png
         else set CurrentWeatherlconImage . Picture to CloudyDay.png
```

## 3. Server Side Functionality

As described above, WeatherGetWeb application data is retrieved by using two API services. First API it's used to retrieve location data, in the case when user do no use GPS. The second API it's used to gather weather data.

Let's describe the handling for the Google Maps API.

The API call will include the city and country typed in Search Box. After the data it's received, it will be broken in JSON format in order to be select the relevant info (latitude,longitude).



With latitude and longitude obtained, the second API will be called, with the same handling (broke lists until I reach the desired value).

```
The special particles in the second of the s
```

When weather data is retrieved, multiple operations are made in order to display the info within application UI.

If API calls have issues, error messages are called in order to know the root cause.

```
else call Notifier1 .ShowMessageDialog
message
title
buttonText

CK

Call Notifier1 .ShowAlert
notice

* ERROR RETRIEVING MAPS DATA

**

Call Notifier1 .ShowAlert
notice

* ERROR RETRIEVING MAPS DATA

**

Call Notifier1 .ShowAlert
notice
```

If GPS location data is not relevant (eg lat=0, long=0) API calls are made until data is relevant.

```
then set LocationSensor1 **. ProviderName ** to ** gps **
set LocationSensor1 **. ProviderLocked ** to ** true **
while lest ** get global latitudeValue ** to ** LocationSensor1 **. Latitude **
set global latitudeValue ** to ** LocationSensor1 **. Latitude **
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set global langitudeValue ** to ** LocationSensor1 **. Latitude **
set global langitudeValue ** to ** LocationSenso
```

Fun fact: when API call was made with (0,0) the retrieved location is Earth.

### 4. Arduino side

Using Arduino UNO and 3 sensors (temperature, humidity, rain detection), application can retrieve real time data. Communication is made my Bluetooth.

### **HW Components:**

- Arduino UNO
- Sensor DHT22 (temperature, humidity)
- Sensor for Raindrops detection
- Bluetooth HC-05

After sensors are read, the values are sent in a specific format which includes a separator, which will be used by application to broke again the bytes in pieces.

```
void ReadSensor_Temperature()
{
   humidity = dht.readHumidity();
   temperature = dht.readTemperature();
}

void ReadSensor_Rain()
{
   int rainSensorReading = analogRead(RAIN_SENSOR);

   //Map sensor rain for easier values handling
   rainRange = map(rainSensorReading, sensorRainMin, sensorRainMax, 0, 4) + 1;
}
```

```
void loop() {

//Read temperature and humidity
ReadSensor_Temperature();

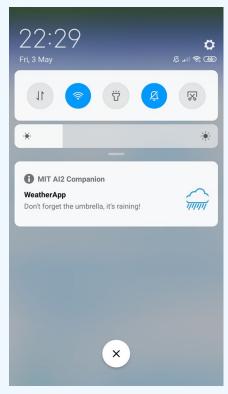
//Read rain sensor
ReadSensor_Rain();

Serial.print(rainRange);
Serial.print("|");
Serial.print((int) temperature);
Serial.print((int) humidity);
Serial.print("|");

delay(2000);
}
```

### 5. Notifications

The only notification used in application it's triggered when weather forecast or sensor announces rain.



Note: App Inventor 2 has some restrictions regarding notifications. The app must be running in order to trigger the notification. For devices with MIUI firmware (sadly mine) the notification it's triggered when app is running in background.

# 6. Maps and Directions

The only service related to maps is the call of Google Maps API, described above on Server Side chapter.