Subject: Software Development Technology

Project Work

Working Experience in All Phases of Development Involved In Creating a “Weather App”

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Change History

Date	Version	Modification	Contributor
2022.11.25.	0.1	Initial version	Takahiro
2022.11.26.	0.2	Add Further Dev	Takahiro
2022.11.26.	0.3	Add Display Result	Takahiro
2022.11.27.	0.4	Add Result for iOS simulator	Yasmine
2022.11.27.	0.5	Update TDD Section	Yasmine
2022.11.27.	0.6	Add Experiences	Takahiro
2022.11.28.	0.7	Add Experiences	Yasmine

Table of Contents

1. Overview

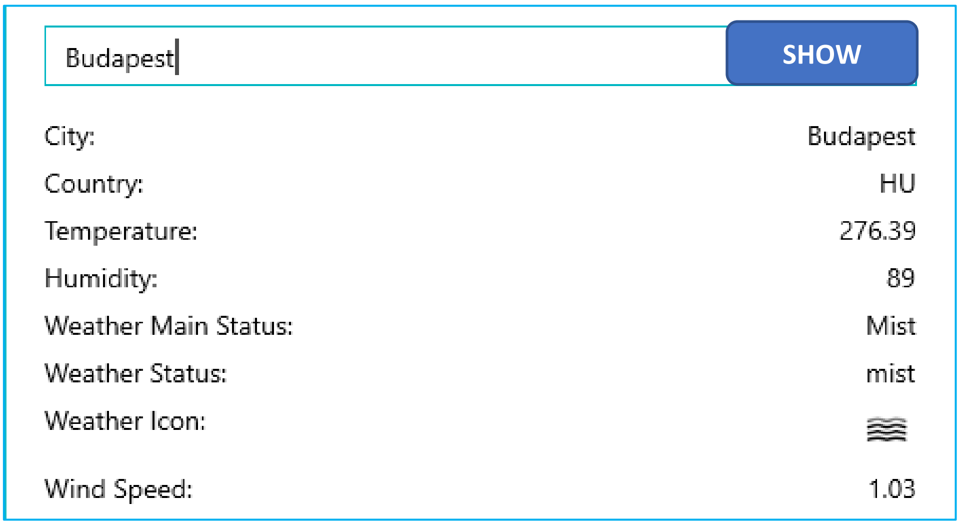
This application shows the current weather from Weather Server, OpenWeatherMap (https://openweathermap.org/) Get the real time weather data from the weather server and show it on the display.

Other reference document:

https://deanilvincent.github.io/2017/07/03/simple-weather-app-in-xamarin-forms-with-mvvm-using-weather-api-part1/

1.1. Application Image

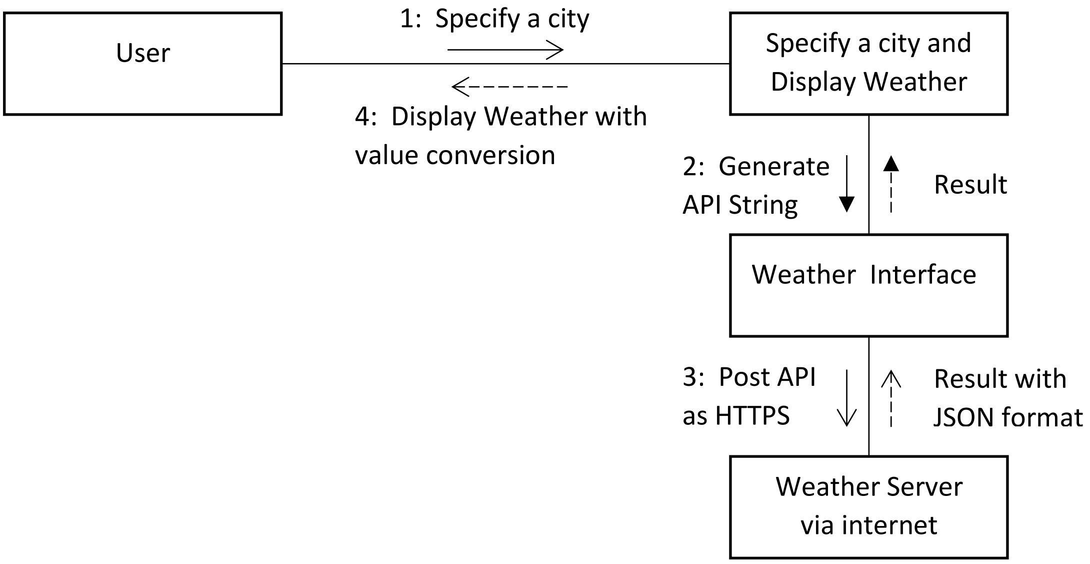
This is an image sample, not a real. Some part will be changed (for example, temperature)



Budapest

City:	Budapest
Country:	HU
Temperature:	276.39
Humidity:	89
Weather Main Status:	Mist
Weather Status:	mist
Weather Icon:	≋
Wind Speed:	1.03

1.2. Communication Diagram



1.3. Different points from the reference web program

- Reference program going to ask each letter input. E.g., in the case of Budapest, type “B” then asking to internet server, type “u” then asking “Bu” …. So, add “Show” button and only after clicking/tapping that button, then going to ask to the Weather sever.
- Temperature number is not good. Change it to Celsius degree.
- Add units for example, Humidity: 89 -> 89%
- Show bigger picture for the weather.

1.4. Non-functional Requirements

- Packaging / deployment work is not included for this project.

2. Development Outline

Platform: Expecting to provide it as UWP/Android/iOS application.

Development Environment: Microsoft Visual Studio 2022.

2.1. Technologies for the Development

Technology	Purpose
Xamarin.Forms	Make available on Windows/Android/iOS.
MVVM model	Separate development with some developers.
Weather API	Get the current weather for each city in the world
Nuget Packages	
Microsoft.Bcl.Build	Provides build infrastructure components so that projects referencing specific Microsoft packages can successfully build.
Microsoft.Net.Http	HttpClient for sending requests over HTTP, as well as HttpRequestMessage and HttpResponseMessage for processing HTTP messages.
Newtonsoft.Json	Handle JSON data easily

2.2. Development Schedule

Task Working Day➔	1	2	3	4	5	6	7	8	9
Research	X	X							
Original Implement		X							
Feature – making button			X	X					
Feature – Temperature conversion					X				
Feature – Add unit					X				
Feature – Add Image						X	X		
Final Test								X	
Documentation		X	X		X		X		X

2.3. Important issue of the Development and Test Environment

In this section, would like to show some of important thing for development and test.

OS version: Windows 10 Home 22H2

Visual Studio: Visual Studio Community 2022 (64bit) Version 17.4.1

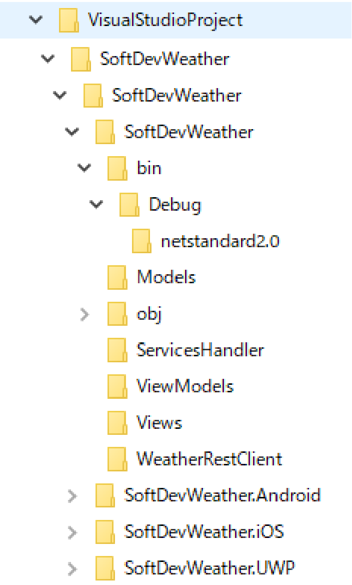
Language: C#, XAML

2.4. Xamarin.Forms Development Directory

There are some restrictions which are found in the previous development.

- **Do not use longer folder name:** There is max file length and Xamarin.Forms development files are placed under the many of sub folders.
- **Do not use virtual drive:** There is unknown restriction at runtime.

So, the example of recommended way is to create a directory C:\VisualStudioProject and place a new project under that directory.

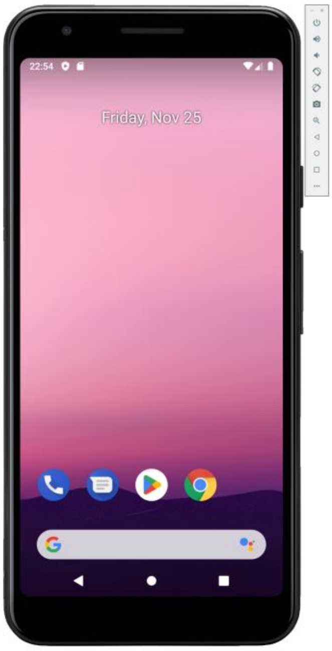


```
VisualStudioProject
  SoftDevWeather
    SoftDevWeather
      SoftDevWeather
        bin
          Debug
            netstandard2.0
        Models
        obj
        ServicesHandler
        ViewModels
        Views
        WeatherRestClient
      SoftDevWeather.Android
      SoftDevWeather.iOS
      SoftDevWeather.UWP
```

2.5. Android Emulator

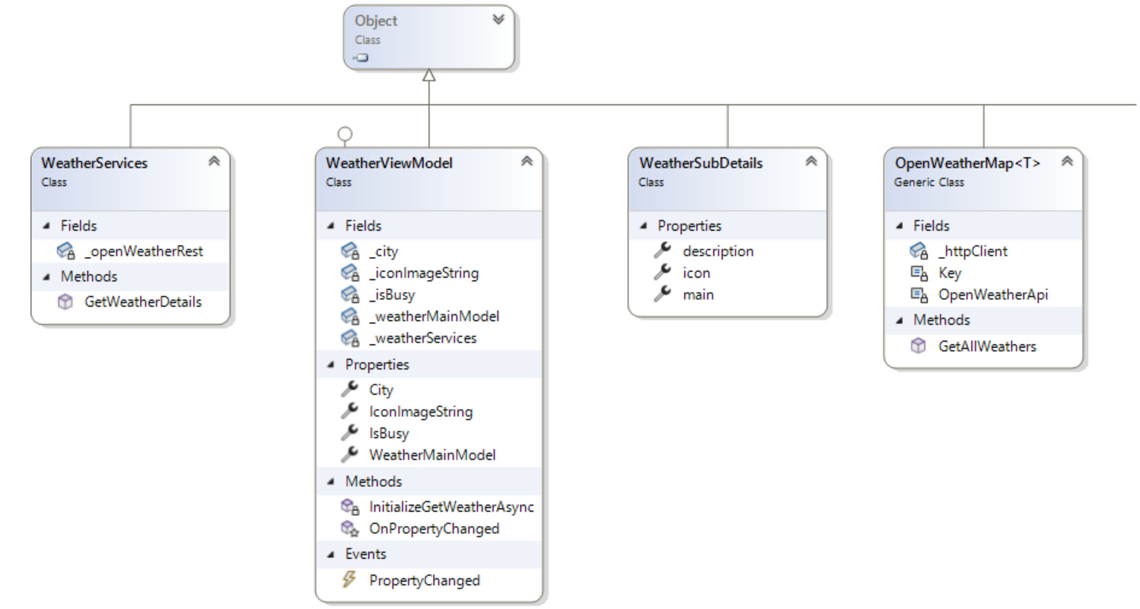
On the Visual Studio 2022, we can not run the emulator of the version Android 10 or later.

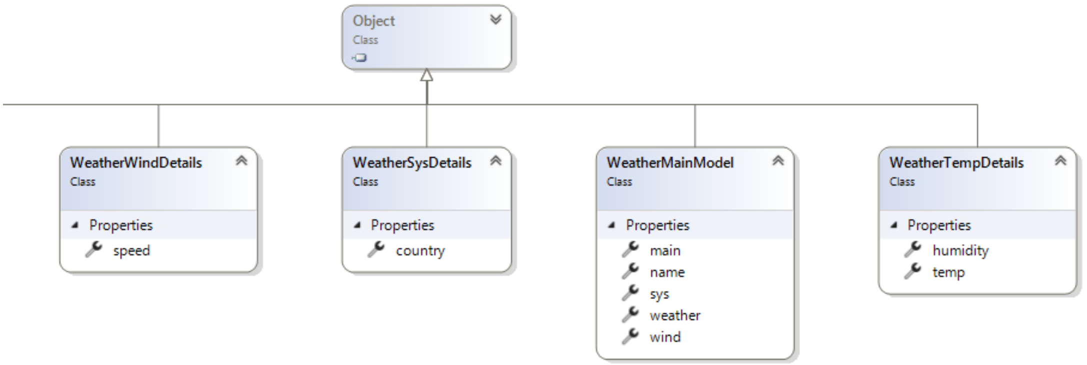
So, the example of recommended way is to create an emulator of Android 9.0 with the hardware: Pixel 3a. Pixel 3a emulator shows very similar hardware looks. Other hardware sometimes shows just a box window, it is not a problem but if we use Pixel 3a, we can be easy to recognize that this is an emulator of the Android Smartphone.

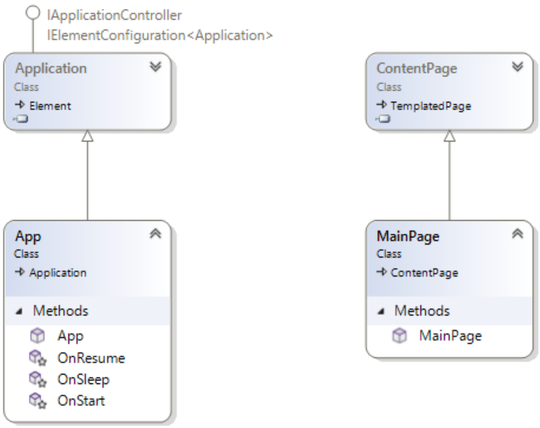


3. Development

Here is the Class Diagram for all classes.







3.1. Solving Web API Problem

It might be a common sense, but we did not know – many of web information is introducing that Web API starts with http:// and it works on UWP windows app.

However, we test it on Android Emulator, screen shows empty page and not able to get a return value from the Web API. There is a possibility of emulator environment problem. So, checked the internet connection using web browser on the Android emulator however, there was no problem.

So, we doubted the API string which is starting http:// because recent web browser refuse http:// connection and use https:// connection. At first checked it is okay on changing API to https:// on the UWP app which we are developing, and it was okay. Then next checked on Android Emulator and finally we could get the correct API result.

3.2. Degree Celsius Conversion

The unit for the Temperature from the OpenWeatherMap is Kelvin.

So, the formula is just this:

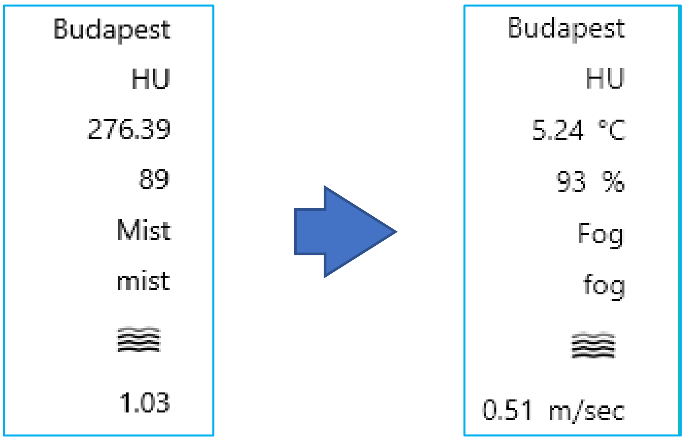
Celsius = Kelvin – 273.15

However, we found that if the following parameter set to the API string, then return value will be Celsius. So, we chose this way.

https://api.openweathermap.org/data/2.5/weather?q=*{city}*&appid=*{key}*&lang=ja&units=metric

3.3. Unit Display

Add °C to the temperature, % to the humidity, m/s to the wind speed.



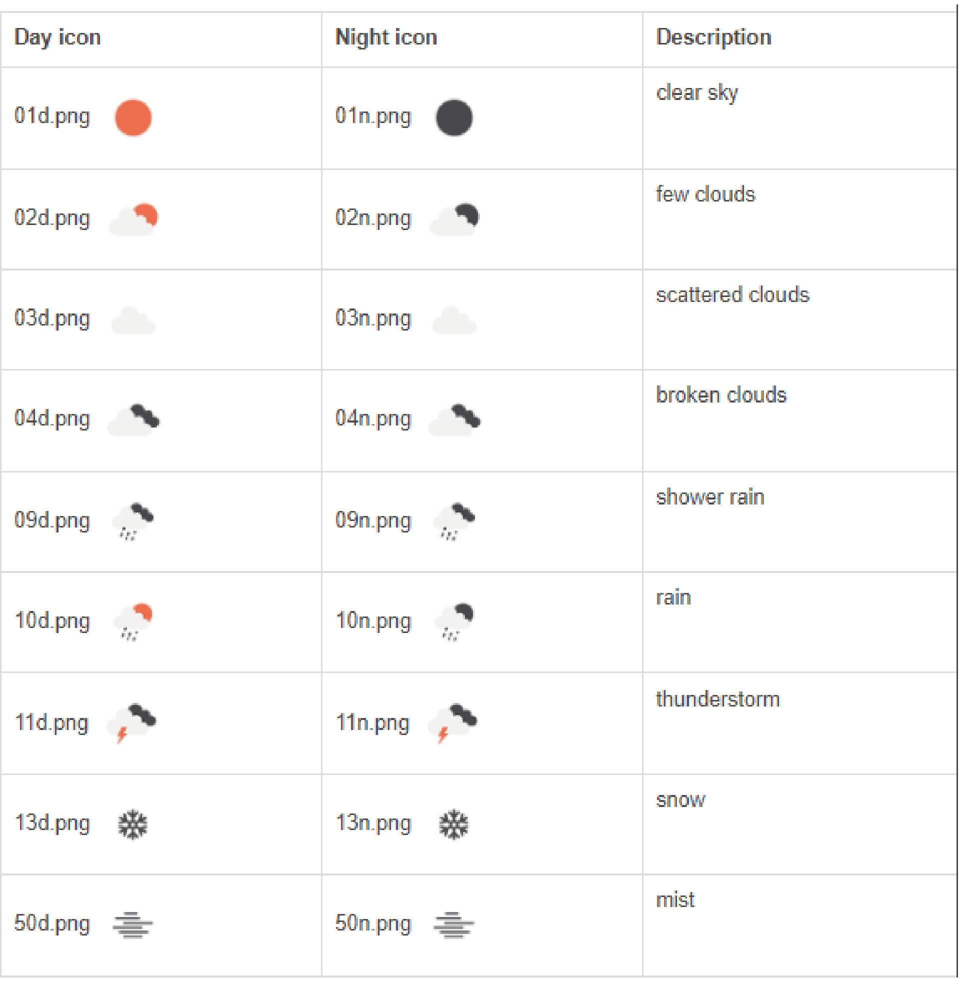
Budapest
HU
276.39
89
Mist
mist
≋
1.03

Budapest
HU
5.24 °C
93 %
Fog
fog
≋
0.51 m/sec

Original version Update version

3.4. Large Images related to the weather

The original weather app is using their icons and we would like to prepare another original picture, which we can get from free license picture. The original icons are 2 x 9 = 18 icons such as follows. It is little hard to prepare 18 icons therefore we will prepare only the day picture and if there is a night weather, we will use day picture, at the moment.



Day icon	Night icon	Description
01d.png	01n.png	clear sky
02d.png	02n.png	few clouds
03d.png	03n.png	scattered clouds
04d.png	04n.png	broken clouds
09d.png	09n.png	shower rain
10d.png	10n.png	rain
11d.png	11n.png	thunderstorm
13d.png	13n.png	snow
50d.png	50n.png	mist

At first, we prepared `Images` folder and placed the jpg files, however it was hard to show it.

Finally, prepared as a web url, the same way to show it as OpenWeatherMap icon. This is also a merit of small packaging size. This app needs to connect to internet, that means the app is available only with the online mode, thus, getting picture from the internet is no problem.

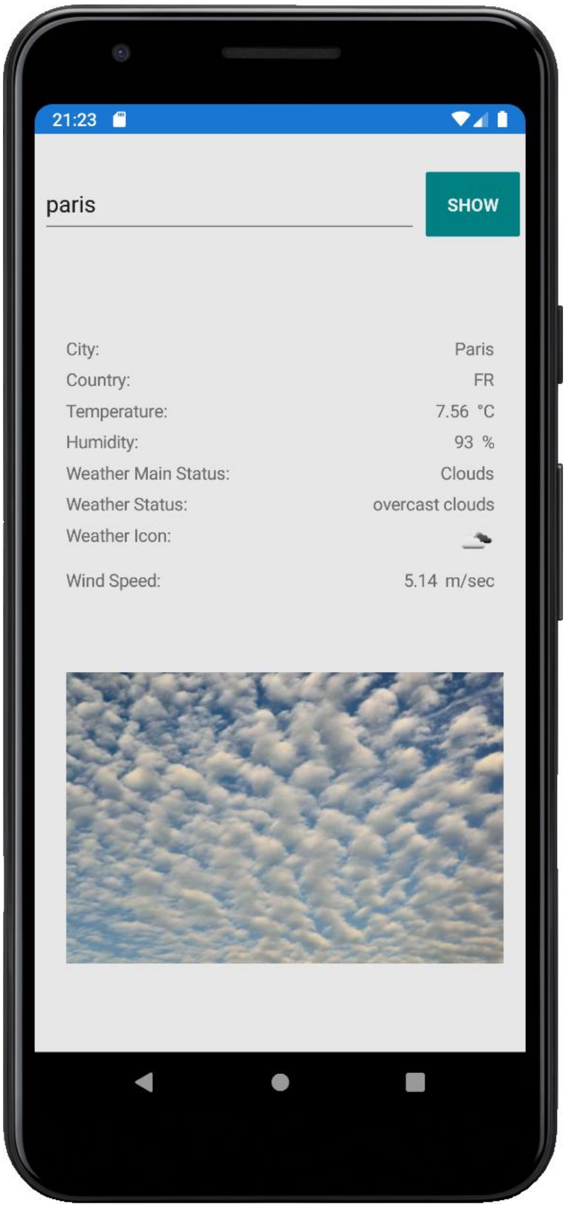
4. Test-Driven Development (TDD)

TDD approach means …. Yasmin please.

We used TDD approach for showing picture for each weather. Because the return weather is a possibility of unknown whether such as “Blizzard”, “Heavy rain” and the ICON file name is skipped but it looks 01 to 50 but the web site explaining only 13 icons. So, we need to test it as unknown weather.

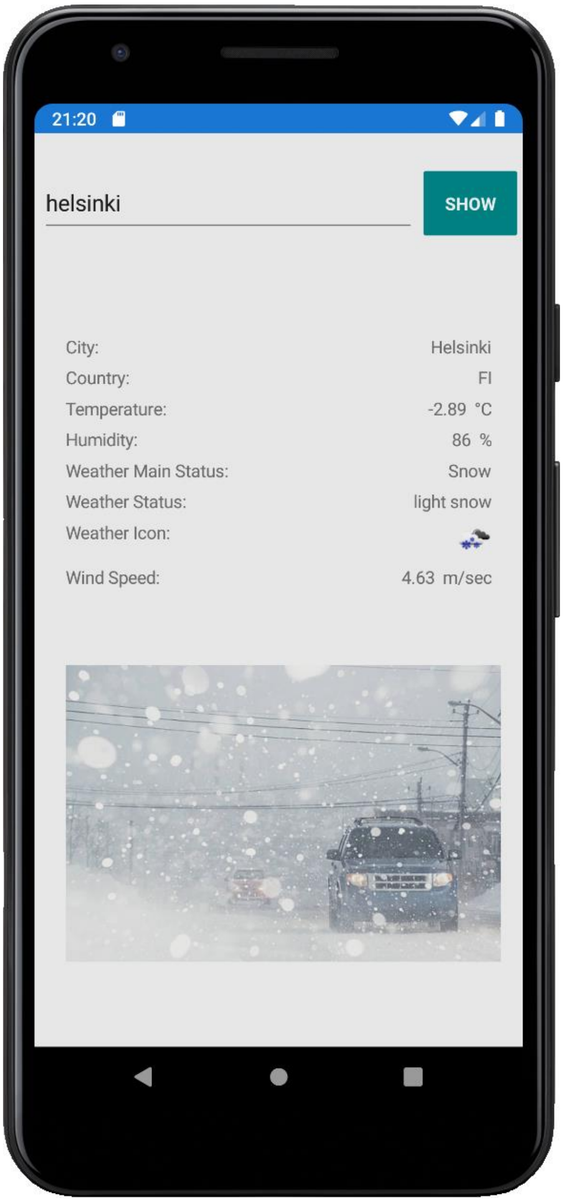
5. Display Results

5.1. Android 9.0 (Pixel 3a) Emulator on Windows



paris

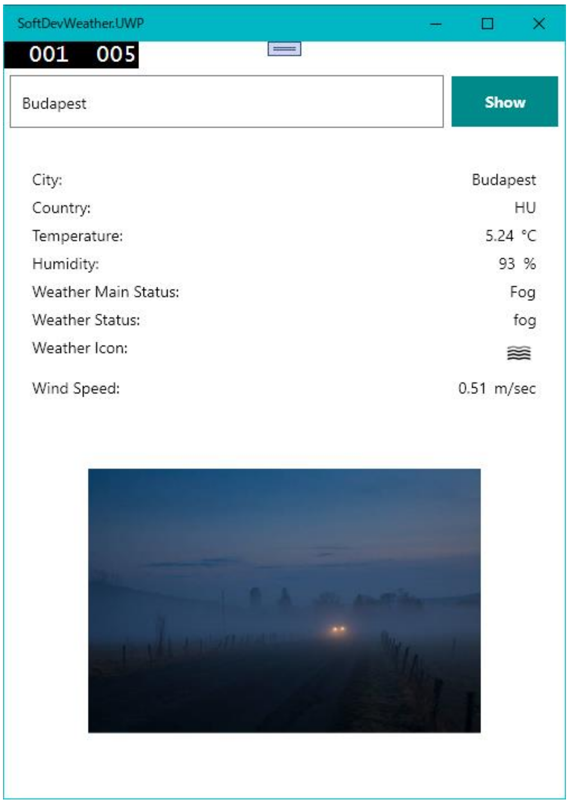
City: Paris
Country: FR
Temperature: 7.56 °C
Humidity: 93 %
Weather Main Status: Clouds
Weather Status: overcast clouds
Weather Icon:
Wind Speed: 5.14 m/sec



helsinki

City: Helsinki
Country: FI
Temperature: -2.89 °C
Humidity: 86 %
Weather Main Status: Snow
Weather Status: light snow
Weather Icon:
Wind Speed: 4.63 m/sec

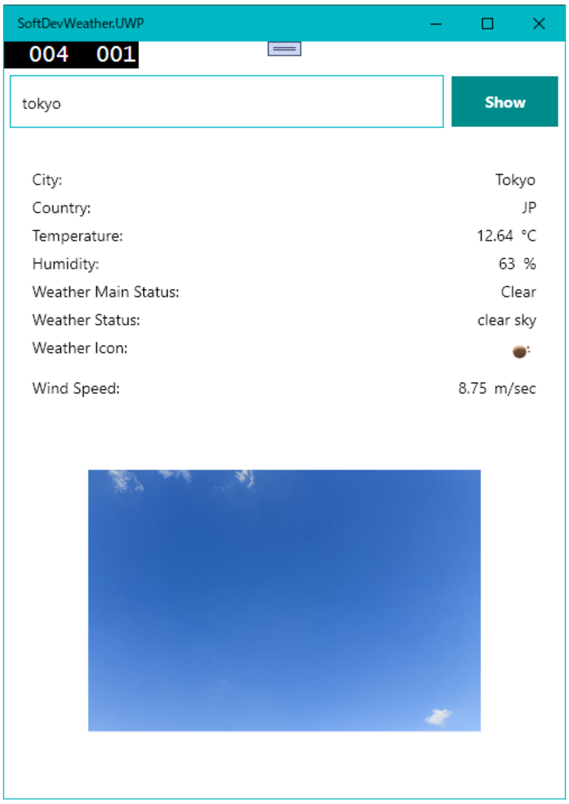
5.2. Windows UWP



001 005

Budapest

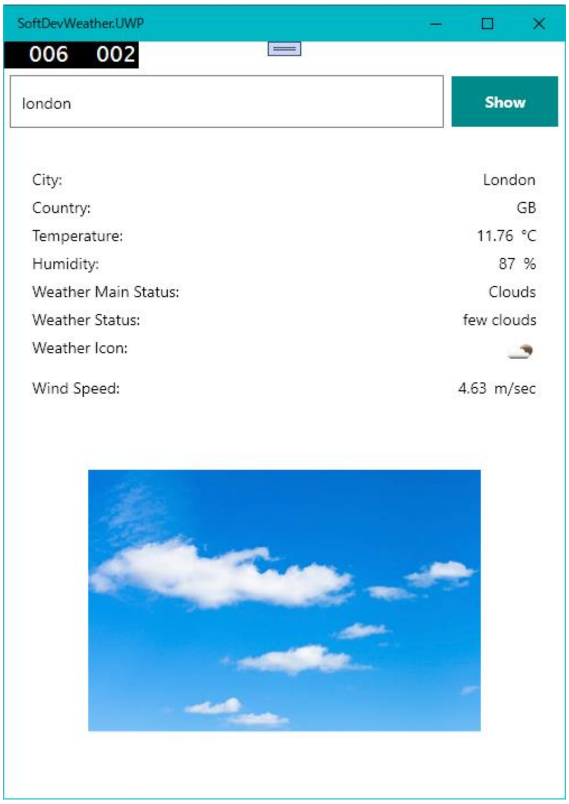
City:	Budapest
Country:	HU
Temperature:	5.24 °C
Humidity:	93 %
Weather Main Status:	Fog
Weather Status:	fog
Weather Icon:	
Wind Speed:	0.51 m/sec



004 001

tokyo

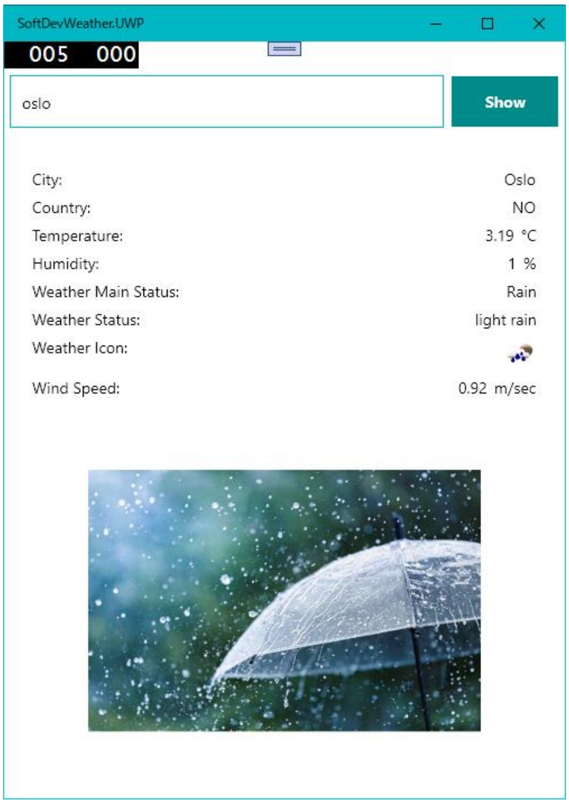
City:	Tokyo
Country:	JP
Temperature:	12.64 °C
Humidity:	63 %
Weather Main Status:	Clear
Weather Status:	clear sky
Weather Icon:	
Wind Speed:	8.75 m/sec



006 002

london

City:	London
Country:	GB
Temperature:	11.76 °C
Humidity:	87 %
Weather Main Status:	Clouds
Weather Status:	few clouds
Weather Icon:	
Wind Speed:	4.63 m/sec



005 000

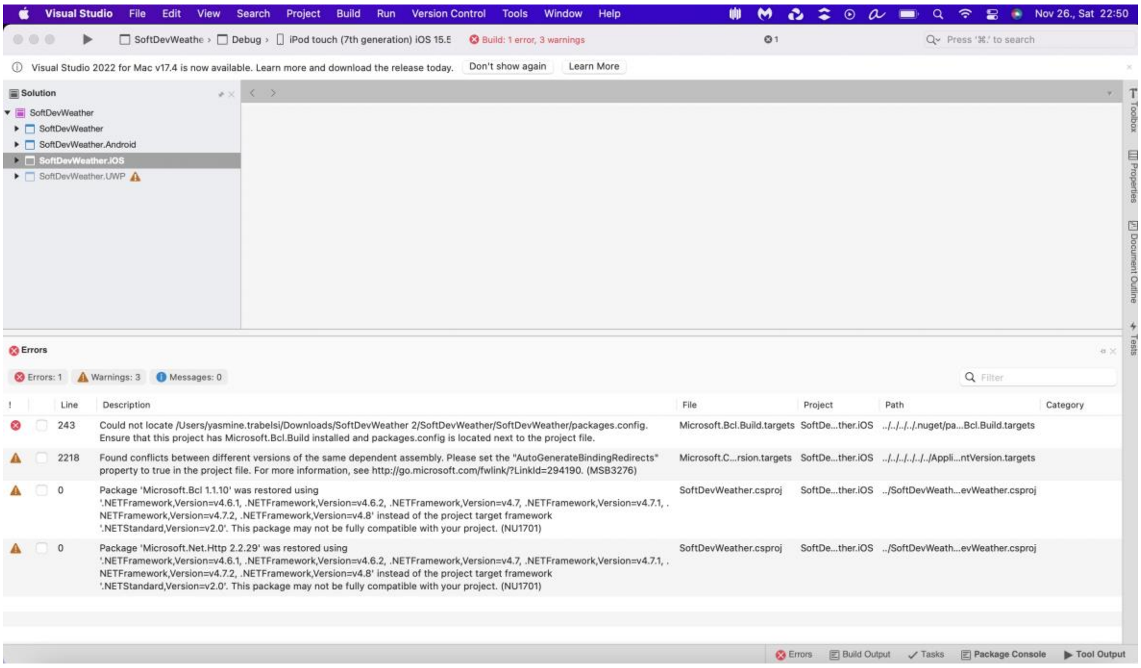
oslo

City:	Oslo
Country:	NO
Temperature:	3.19 °C
Humidity:	1 %
Weather Main Status:	Rain
Weather Status:	light rain
Weather Icon:	
Wind Speed:	0.92 m/sec

5.3. iOS Simulator on macOS

We tried with the iOS Simulator.

However, there are some errors and not worked.

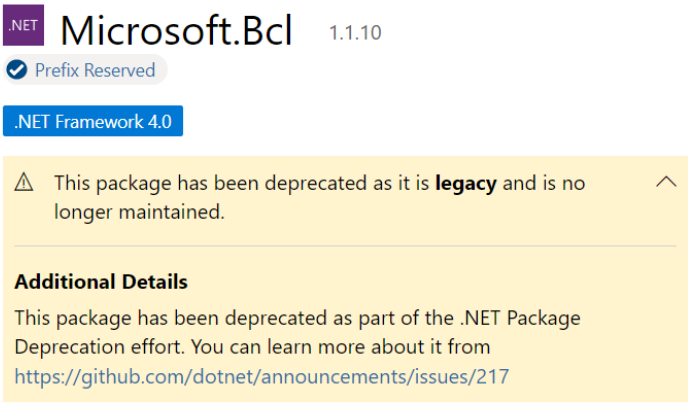


Visual Studio 2022 for Mac v17.4 is now available. Learn more and download the release today.

!		Line	Description	File	Project	Path	Category
⊗	□	243	Could not locate /Users/yasmine.trabelsi/Downloads/SoftDevWeather 2/SoftDevWeather/SoftDevWeather/packages.config. Ensure that this project has Microsoft.Bcl.Build installed and packages.config is located next to the project file.	Microsoft.Bcl.Build.targets	SoftDe...ther.iOS	../../../../.nuget/pa...Bcl.Build.targets	
⚠	□	2218	Found conflicts between different versions of the same dependent assembly. Please set the "AutoGenerateBindingRedirects" property to true in the project file. For more information, see http://go.microsoft.com/fwlink/?LinkId=294190. (MSB3276)	Microsoft.C...rsion.targets	SoftDe...ther.iOS	../../../../../../Appli...ntVersion.targets	
⚠	□	0	Package 'Microsoft.Bcl 1.1.10' was restored using '.NETFramework,Version=v4.6.1, .NETFramework,Version=v4.6.2, .NETFramework,Version=v4.7, .NETFramework,Version=v4.7.1, .NETFramework,Version=v4.7.2, .NETFramework,Version=v4.8' instead of the project target framework '.NETStandard,Version=v2.0'. This package may not be fully compatible with your project. (NU1701)	SoftDevWeather.csproj	SoftDe...ther.iOS	../SoftDevWeath...evWeather.csproj	
⚠	□	0	Package 'Microsoft.Net.Http 2.2.29' was restored using '.NETFramework,Version=v4.6.1, .NETFramework,Version=v4.6.2, .NETFramework,Version=v4.7, .NETFramework,Version=v4.7.1, .NETFramework,Version=v4.7.2, .NETFramework,Version=v4.8' instead of the project target framework '.NETStandard,Version=v2.0'. This package may not be fully compatible with your project. (NU1701)	SoftDevWeather.csproj	SoftDe...ther.iOS	../SoftDevWeath...evWeather.csproj	

```
/Users/yasmine.trabelsi/.nuget/packages/microsoft.bcl.build/1.0.21/bui
ld/Microsoft.Bcl.Build.targets(5,5): Error: Could not locate
/Users/yasmine.trabelsi/Downloads/SoftDevWeather
2/SoftDevWeather/SoftDevWeather/packages.config.  Ensure that this
project has Microsoft.Bcl.Build installed and packages.config is
located next to the project file. (SoftDevWeather.iOS)
```

Actually, Microsoft.Bcl.Build is active however Microsoft.Bcl is deprecated. So, some maintenance is needed but we could not find the solution is these working days.



⚠ This package has been deprecated as it is **legacy** and is no longer maintained.

Additional Details

This package has been deprecated as part of the .NET Package Deprecation effort. You can learn more about it from https://github.com/dotnet/announcements/issues/217

We would like to leave this issue as a future work.

6. Possibilities for Further Development

We can add more feature to the weather application. For example:

- Store the cities which the user specified and easy to select it from a combo box.
- Show the world map with clickable points
- Connect the above specified city and the map. In this view, the weather icon is displayed with the city name on the appropriate position – need to use geographic location so it is harder.
- In the OpenWeatherMap, there is a function to get a weather forecast 5 days. So, we can add the forecast page for the city.

7. Summarize of the Experiences

Here are our experiences.

7.1. Takahiro Fujiwara

- Preparing development environment is very hard, especially Xamarin and emulator thing. Web information is not fit for the latest version of Xamarin and Android emulator, so It was very hard to solve it. However, we understood that when we got that environment, we can develop a cross platform applications, easily.
- It is new to me that using Web API and JSON handlings.
- Working days are not enough, especially this semester was hard due to the Autumn holiday is disappeared – all subjects are compressed.

7.2. Yasmine Trabelsi