HOTLINE SERVICE

MD. MOBINUL ISLAM MOBIN

A project submitted
in partial fulfilment of the requirements
for the degree of
Bachelor of Science in Computer Science and Engineering

UNIVERSITY OF LIBERAL ARTS, BANGLADESH
Dhaka, Bangladesh

4th January 2018

DECLARATION

I declare that this report entitled “Hotline Service” is the result of my own research except as cited in the references. The report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature :

Name **:** MD. MOBINUL ISLAM MOBIN
ID **:** 132014022
Date **:** January 4, 2018

CERTIFICATE OF APPROVAL

The project report entitled “Hotline Service” is submitted to the Department of Computer Science and Engineering, University of Liberal Arts Bangladesh, Dhaka in partial fulfillment of the requirements for the degree of Bachelor of Science.

Dated: 4th January 2018

Dr. A.K.M. Muzahidul Islam
Associate Professor and Head of the Department
Computer Science and Engineering
University of Liberal Arts Bangladesh

Signature & Date

Md. Anowarul Abedin
Senior Lecturer
Computer Science and Engineering
University of Liberal Arts Bangladesh

Signature & Date

DEDICATION

To my lovely parents, who gave me endless love, trust, constant encouragement over the years, and for their prayers.

To my mentors and peers for their patience, support, love, and for enduring the ups and downs during the completion of this thesis.

This report is dedicated to them.

ACKNOWLEDGEMENT

I wish to express my deepest appreciation to all those who helped me, in one way or another, to complete this project. First and foremost, I thank Almighty who provided me with strength, direction and purpose throughout the project.

Special thanks to my project supervisor Md. Anowarul Abedin all his patience, guidance and support during the execution of this project. Through his expert guidance, I was able to overcome all the obstacles that I encountered in these enduring three months of my project. In fact, he always gave me immense hope every time I consulted with her over problems relating to my project.

I would like to thank our department head Assoc. Prof. Dr. A.K.M. Muzahidul Islam for approving my report and the faculty members of their support. At last but not the least, I thank my parents, relatives and friends for their unquestionable trust in me.

ABSTRACT

Hotline Service is an automated report box system. Public post any issue as a report to administrator. Users don't have any account, but service provider will create an account. When users face any problem like wastes, crime etc. Somewhere they just open our application and select expected category and send the photo to the administrator or service provider. On that time, users send the GPS location with the request, and all service providers will see the request and identify the location. The notified service provider will be then responsible to solve the respective problem.

The Software consists of a backend (ASP.NET Core Web API) to control all our services. Then a web application (Angular 2) has been created for service providers or administrators and cross platform (Xamarin.Forms) mobile application for service seekers or users.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

BRTC	Bangladesh Telecommunication Regulatory Commission
API	Application Programming Interface
GPS	Global Positioning System
NGO	Non-Governmental Organization
ASP.NET	Active Server Pages
SQL	Structured Query Language
IDE	Integrated Development Environment
GUI	Graphical User Interface
IOT	Internet of Things
HTTP	Hyper Text Transfer Protocol
OOP	Object - Oriented Programming
LINQ	Language-Integrated Query
OS	Operating System
UI	User Interface
MVC	Model View Controller
MVVM	Model – View – ViewModel
SDK	Software Development Kit
HTML	Hypertext Markup Language
CSS	Cascading Style Sheets
NPM	Node Package Manager
DOM	Document Object Model
XML	Extensible Markup Language
ICT	Information and Communication Technology
UML	Unified Modeling Language
CORS	Cross-Origin Resource Sharing
URL	Uniform Resource Locator
JSON	JavaScript Object Notation
XAML	Extensible Application Markup Language

CHAPTER 1

INTRODUCTION

Bangladesh is going to be a digital country. Digital means, all work and activities are done by using internet, but we can't use it properly or there is many lack of facilities. We use many Government or Non-Government emergency hotline number for many services like hiring ambulance, report on cleaning to city corporation, report on crime to police and any corporate office help service etc. That time we are calling hotline number for get those types of services, and we pay the call charge or will pay the service provider. Sometimes, we face a trouble because service providers can't identify our accurate location. We think about this situation and try to find out an easy solution. Now 7.3347 Cores (BTRC Statistic) people are using internet in Bangladesh and day by day is going to be high. So, we are planning to develop a mobile application on those services.

Users don't have any account. Just service provider will create an account. When users face any problem like wastes, crime etc. in anywhere they just open our application and select expected category and attached photo then send a request to administrator or service providers. On that time, users send the GPS location with the request, and all service providers will see the request and identify the users sending location. When one service provider notifies the users request then they complete the task or help them their own way. It is very easy way better than calling system.

Firstly, we develop a backend (Web API) to control all our services. Then we will develop a web application for organization or service providers and cross platform mobile application for service seekers.

1.1 Problem Background

City corporation will be working very closely to make the city Clean, Livable and Vibrant for the present and the future generations. Already many NGOs like-BDClean working on cleaning the wastes with city corporation, but they can't notice all places or sometimes their staff didn't work properly. That reason many road and dustbin becomes dirty. In Eid al-Adha, animals are sacrificed at Qurbani by Muslim people. That time roads become very dirty by Qurbani wastes. City corporation is taking many steps to clean up these wastes and they cleaned waste. Sometimes, they miss some area to cleaning, because they can't scan all areas. This area spreads dirty smell of wastes. On the other hand, they are messaging all people and provide a hotline number for complain about to city corporation, but this is irritating. We try to solve this problem through a mobile application.

Now crime number is going to be high in Bangladesh, like murder, eve teasing, Corruption, fighting etc. Sometimes, we see many crime video or picture on Facebook Newsfeed or other social media. When a crime occurred, People taking video or picture and upload on social media. People do not have police phone numbers. So, they don't report to police about the crime. In some situations, people don't even want to report because they are afraid of being exposed. Police don't notice always on social media. If our application is live, then people open our application and easily report to the police. It's very helpful for police to take immediate step against this crime and many criminals could be caught easily. Mean time reporter's identity has been kept safe.

1.2 Project Development Aim

Here we describe the development aim in below:

i. **Create a web API:** To create a web API for client and server are totally separate. We use ASP.NET Core web API for built it.

ii. **Create a website for services providers:** We use bootstrap framework for building the website. In this website, service providers monitoring all report what service seekers want? Service providers also see the attached file and seekers sending location. Service providers also comment and reply to seekers in their reports.

iii. **Create a Signup and Sign in System for Service Providers:** To go to the website, all service providers need to sign up and login for using the system. They provide their information and service name in sign up page.

iv. **Create Cross-Platform Mobile Application for Service Seekers:** Develop a cross platforms mobile application using Xamain.Forms. To submit a report service seeker must going to the mobile application and fill up the expected information. Service seekers also monitoring and comment on submitted report.

1.3 Objectives

This project following these objectives:

i. Make easier communication public to administration.
ii. Make easy way to get services without any hassle.
iii. Reduce hotline number services.
iv. Make sure communication without call-charge.
v. "All hotline number services turn into this application" it's our main vision.

1.4 Project Scope

This report is mainly made for academic purpose and fulfill the partial requirement of CSE program from the Department of Computer Science and Engineering (CSE), University of Liberal Arts Bangladesh.

1.5 Project Contributions

The main aim of this project “Gather the people’s problem and easily reached to the administrator”. Every people use the service and send their problems (which organization included under this service) to organization without phone call. Administrator or organization see the posted report and give a solution to the users. Administrator gives their feedback on any reports through replies, and peoples tracking their posted report which issue is Under Processing or which is Done, or which is Wrong. Most important facilities in our service, we accept any report from peoples without identity. For that, every people are safe.

1.6 Project Report Organization

On this report paper, we discuss about introduction (Chapter 1) of the report, and here we include these paragraph like problem background, project aim, objectives, project scope, project contribution and project report organization. In chapter 2 name Literature Review we discuss about the study background for this project. This chapter we include .NET Platform, .NET Core, ASP.NET Core, Web API, Xamarin, Microsoft SQL Server, LINQ, angular and why use these in our development. Another thing in this chapter, which similar service were exiting in our country, and describe the difference between our service and those exiting service. In chapter 3 name Project Methodology we describe about project identification, features, use case diagram, activity diagram, database diagram, user interface for all platforms like Landing page, Angular Web Application, Android Application and Windows Application. In chapter 4 name Implementation, here we describe about development process, technology selection and deployment on azure. In Chapter 5 we describe about some testing.

CHAPTER 2

LITERATURE REVIEW

In our Development, we mainly use Microsoft Technologies and tools. We are developing the project with Microsoft Asp.net core, Xamarin and Angular 2. We use the SQL Database and Microsoft SQL Server Studio for database and their management services. For the development purpose, we use Microsoft Visual Studio 2017 Community Version to develop our service.

2.1 Microsoft Visual Studio

MS Visual Studio is an Integrated Development Environment (IDE) for Microsoft. This can provide many recent technologies for the development of software and web apps. This can be used to develop in many purposes such as web programming, smart phone applications development, desktop applications and many more. This IDE provides “IntelliSense” and refactoring to help the programmer to do coding faster and easier. This comes with latest modern life cycle tools. For development purpose, it is the best solution. We use visual studio 2017 community version in our development.

2.2 .NET Platform

Microsoft current platform is .NET Platform [1]. There are many other platforms in computer programming world. With many good side and benefits, each of them has some limitations and problems. For C, there are thousands of applications build in this language. But some problem occurs when we must manually manage memory, pointer arithmetic, and syntactical constructs. Without Object Oriented Programming (OOP), C is very complex. Then C++ come with OOP concept, but the pointer arithmetic,

manual memory management and syntactical construct are still there. Visual Basic comes with its ability to build complex user interface, database access logic and code libraries. It was very popular for those qualities. It hides the complexities of Windows API from the view using an integrated code wizard. But it is not object oriented. It is rather object based. It cannot build multithread applications. So, this makes visual basic 6.0 to go down. Java is a very good language and its support OOP. It has solved the C, C++ language problem. The main strength in Java programming is its platform independence. It has many library packages that can help a programmer to worry free life. But main problem with Java is language integration. Java provides a limited ability to access Non-Java APIs. The .NET comes with the solution. It is mainly a software platform to build systems for the windows operating systems, but it also supports Non-Microsoft OS like MacOS and Linux distributions. It is fully object oriented. Here are some key features of .NET:

i. Interoperability with existing code.
ii. Support many programming languages such as F#, C#, ASP, VB, S# etc.
iii. Common runtime environment shared by all .NET languages
iv. Complete and total language Integration: cross language inheritance, exception handling and debugging
v. Comprehensive base class libraries cover the complexities of raw APIs

There are three key entities of Dot Net. They are CLR, CTS and CLS. CLR is common language runtime [2]. The primary role of CLR is to locate, load and mange .NET types. It also provides memory management, application hosting, handling threads and security checks. CTS stands for Common Type System. It describes the possible data types and programming constructs. CLR stands for Common language specification. CLS stands for Common Language Specification. It is a set of basic language features that .Net Languages needed to develop Applications and Services, which are compatible with the .Net Framework.

2.3 .NET Core

.NET Core is a subset of the .NET Framework. .NET Core is Cross-platform free and open-source software framework like .NET Framework [3]. .NET Core is feature complete, and includes the Base Class Library, many components found in the .NET Framework and these are not included in .NET Core. .NET Core is completely modular. Every Component is delivered by NuGet. it's mean, we can include in every application only the modules which is need.

.NET Core supports four cross-platform applications: ASP.NET Core web apps, command-line apps, libraries, and Universal Windows Platform apps. It does not implement Windows Forms which render the standard GUI for desktop software on Windows.

2.4 ASP.NET Core

ASP.NET Core is one the most popular and strong platform to create server-side application. ASP.NET Core can create cross platform application and build and run on windows, macOS and Linux [4]. ASP.NET Core is redesign and architectural change from ASP.NET. It's totally open source and available on GitHub. It able to create web API, web application, IOT application and mobile backend. It has a built-in dependency injection. ASP.NET Core has built-in features for handling errors in apps, including a developer exception page, custom error pages, static status code pages, and startup exception handling. A lightweight and modular HTTP request pipeline. It's run on .NET core or .NET Framework. We use ASP.NET Core in our project because it's a high-performance framework than ASP.NET. It's a play a leading position on industrial work. ASP.NET core project creates many things to by default.

2.5 Why We Choose .NET Core Platform

We develop our application with .NET Core Platform. But if we want to develop with another language like PHP, Python etc. It's possible but will face some problems or disadvantages. We will not get better feedback on other platforms. so, we choose .NET Core.

Firstly, we discuss about PHP Hypertext Preprocessor. It is open source object oriented programming language. It has many frameworks for application development. Some drawbacks are discussed below:

i. Not suitable for large applications because it's Hard to maintain since it is not very modular [5]. Some libraries are written by a programmer which his/her needed and it may be difficult for programmers with an OOP background to maintain.
ii. PHP is weak type language. Careless Developers might be surprised by the implicit transformation in the language. This could consequently lead to bugs that are unexpected. For example, the '1e3' and '1000' strings are equally compared since they are cast implicitly for point numbers floating.
iii. Poor Error Handling. it is widely believed by all developers that PHP is not perfect for error handling. Because PHP cannot search properly for errors and warning. PHP has less number of debugging tools when compared to other programming languages.

Secondly, we discuss about Python. Python is a widely used high-level object-oriented programming language for general-purpose programming. Some drawbacks are discussed below:

i. It's very slow [6]. A lot of times this matter does not create any problem, but sometimes need another language for better performance. Python executes with the help of an interpreter instead of the compiler, which causes it to slow down because compilation and execution help it to work normally. Lastly, we say "Speed is not a problem until it is a problem".

ii. Weak in Mobile Computing [7]. Python is not a perfect language for mobile development. Python has made its approach on many desktop and server platforms, but it is a weak language for mobile computing. This is the reason very few mobile applications are built with python.

iii. The documentation isn't as good as languages like C#, PHP and Java that have strong object-oriented programming languages.

At last we say .NET Core platforms is the best way to develop for multiple platforms.

2.6 Web API

Basically, we need to have an Web API if we want to store and process our data in server and let any other application (web application, mobile application, IoT devices etc.) request and get data from that server if needed. These other applications can be part of the system or can open our data for others to use. Web API is a most powerful and easy way to build HTTP services for browsers and mobile apps. If any services have API [8] then we will work on any platforms whatever we want through HTTP request. Any services have two parts one is server side and Client side. Client side send HTTP request and server-side return HTTP response. Web API send and receive data as a Json format. Another benefit is model binding automatically maps data from HTTP requests to action method parameters.

ASP.NET Core Web API use in our project because we don't want to server-side and client-side are coupled. Every side are independent in own way, and it's easy to reconstruct any side when developers want.

2.7 Microsoft SQL Server

Microsoft SQL Server is a relational database management system. it’s developed by Microsoft. SQL Server built for storing and reclaiming data when needed [9]. It can be run on the computer and across a network. SQL Server is used

for creating computer local host database. Microsoft SQL Server (Please see logo in Figure 2.1) provides an environment used to create database that can be accessed from workstations. A computer database is one whose values are stored in a computer medium such a hard disk. A desktop database in one that is used one computer.

Figure 2.1: Microsoft SQL Server

SQL Server usage to create and maintain database and maintain other database objects such as stored procedures, views, etc. Many advantages of using SQL Server like install deferent versions in one machine, reduce cost, maintain production and development. It's very easy to maintain through visual studio 2017 or Microsoft SQL Server Management Studio 2017.

2.8 LINQ

The Language-Integrated Query (LINQ) is a set of extensions to the .NET Framework that encompass language-integrated query, set, and transform operations. It extends C# with native language syntax for queries and provides class libraries [42] to take advantage of these capabilities. LINQ introduces standard, easily-learned patterns for querying and updating data, and the technology can be extended to support potentially any kind of data store. Visual Studio includes LINQ provider assemblies that enable the use of LINQ with .NET Framework collections, SQL Server databases. LINQ commands are used such as an operation like "Select", "Insert", "Update", "Delete" and "Create" etc. can be used when needs to do with a database.

Different Flavors of LINQ:

i. LINQ to Objects: This allows us to execute queries on any IEnumerable object.
ii. LINQ to SQL: which allows us to execute queries against a database in an object-oriented manner.

Benefit of LINQ:

i. Standardized way to query multiple data sources.
ii. Compile time safety of queries.
iii. Optimized way to perform set based operations on in memory objects.
iv. Ability to debug queries.

2.9 Xamarin

Nowadays, mobiles are more of necessity than a luxury. Besides making calls there are many other features which are gaining popularity like Music, Global Positioning System, Accelerometer, etc. These kinds of built-in features are provided by all major available mobile Operating Systems, such as Android, iPhone, Windows Phone. All these mentioned mobile OS's are very popular in the market because of their uniqueness, for example Android is based on Java and freely available, iOS provides innovative features and quality.

The basic architecture and support of programming language of OS's is very different from each other. Developed applications for a certain OS are not compatible for other OS's, indeed, they force developers to rebuild the same applications for android vs iOS. Cross-platform mobile development tools are gaining popularity in the world due to their characteristic to compile the application source code for multiple supported OS's. Xamarin.Forms is a cross-platform [10] User Interface toolkit that allows developers to efficiently create native user interface layouts and it can be shared across iOS, Android, Windows Phone, and Universal Windows

Platform apps. The basics of Xamarin.Forms development and covers building multi-platform and multi-screen applications. Xamarin provides many tools and these targets the native Mac, iOS, and Android APIs using C# and .NET. These tools are called Xamarin.Mac, Xamarin.iOS, and Xamarin.Android. These are libraries and bindings that express the native APIs of these platforms with .NET idioms.

Developers can use the Xamarin platform to write applications in C# that target Mac, iOS, or Android. But when targeting more than one platform, it makes a lot of sense to share some of the code among the target platforms. With a C#-shared codebase, developers can use Xamarin tools to write native Android, iOS, and Windows apps with native user interfaces and share code across multiple platforms, including Windows and macOS.

2.10 Why We Choose Xamarin

In these cases, it is more sensible to follow what modern organizations and application developers do anything like ‘write once and run anywhere’ with cross-platform development since it enables to create applications that can keep running on different platforms. With regards to cross-stage development for mobile, the most famous [11] frameworks that names come in our mind like Appcelerator Titanium, Xamarin and PhoneGap. All these frameworks use that reason for developing a single app for multiple platforms. Xamarin, initially called MonoTouch is another cross-platform framework that has picked up the development market with its own IDE. It works with C# inside .NET framework and enables to make native applications by using native APIs and UIs of every platform. Xamarin comes with Xamarin.Forms library which enables to write native UIs for once and share and change them to platform-specific UIs. Xamarin at present supports iOS, Android and Windows platform. It additionally allows creating applications for Blackberry by compiling Android applications. Features of Xamarin in below:

i. Xamarin has Test Cloud which enables to test any applications automatically.

ii. Provides 100% code reuse with Xamarin.Forms UI development using shared code base and logic. This saves a ton of time and resources.
iii. Backings designs like MVC and MVVM.
iv. Xamarin.Android supports Google Glass devices, Android Wear, and Firephone.
v. Learning curve is relative. If anyone knows C#, it is comparatively simple to get started with Xamarin.

Now we discuss, why we choose Xamarin for mobile application development.

2.10.1 PhoneGap

PhoneGap is an opensource and easiest cross-platform framework. It permits making mobile applications using Web APIs. It utilizes a cloud-based service called 'Build' with which compile applications for several operating systems without the need to install SDKs of each platform. Any PhoneGap application is just a collection of HTML pages which is rendered as an Web View. To create applications in PhoneGap and must utilize HTML5, CSS and JavaScript.

i. Lower performance of applications as the original codes of the application remains that of a web application and launches through a web browser. This means the execution of PhoneGap applications doesn't approach native applications.
ii. Too many fragmented libraries and frameworks at a very basic level.
iii. User interface of app varies depending on the quality of Web View rendered.

2.10.2 Appcelerator Titanium

Appcelerator Titanium is a JavaScript-based development platform in that, it utilizes JavaScript to write application codes with native APIs and UI traditions of

every platform. This means, it doesn't try to achieve the thought ‘write once and run anywhere’ but it attempts to write applications reusing JavaScript with platform-specific features and performance. It is bit more Complex than Xamarin and PhoneGap there is having to learn the UI API of every platform over and above JavaScript which again is complex for building big applications. Titanium right now supports just Android and iOS.

i. No support for third-party libraries.
ii. Trouble in developing complex applications.
iii. It doesn't utilize HTML5 and CSS, the animations and DOM components are less responsive.

2.11 Angular

AngularJS is the most popular JavaScript framework accessible today to create web applications. And now Angular 2 and TypeScript are bringing true object-oriented web development to the standard, in a syntax structure that is near Java 8. Angular 2 is really a superior than AngularJS or Angular 1. Angular 2 is an open source JavaScript framework to create web applications in HTML [12] and JavaScript or TypeScript (Superset of JavaScript). It has replaced a lot of the old cruft that was available in Angular 1 and furthermore exceeds the abilities of other frameworks. In any case, Angular 2 is totally different than Angular 1. It's not as basic as running npm install to upgrade Angular 1 applications to Angular 2. It's fundamentally an alternate framework - however it depends on similar ideas that initially made Angular 1 extraordinary, and in addition some new ideas and technologies that have risen in recent years.

Prerequisite of Angular Development: When we start to develop an angular web application, firstly we need to set up the requisite environment.

i. **Step 1:** Set up the Development Environment- Install Node.js and npm if not installed in machine. (Verify that are running at least node 6.9.x and

npm 3.x.x by running node -v and npm -v in a terminal or console window. Older versions produce errors, but newer versions are well.)

ii. **Step 2:** Create a new Angular project.

iii. **Step 3:** Then install the Angular CLI globally. npm install -g @angular/cli for create new file of set in the project. For file creating: ng g c foldername/filename –flat.

iv. **Step 4:** npm start in terminal window. Then the project run in localhost and see the output of the project.

Features of Angular 2:

i. **Components** - The earlier version of Angular had a concentration of Controllers however now has changed the concentration to having [13] components over controllers. components help to build the applications with many modules. This helps in better maintaining the application over undefined time frame.

ii. **TypeScript** - The newer version of Angular depends on TypeScript. This is a superset of JavaScript and is maintained the scripting language by Microsoft.

iii. **Services** - Services are a set of code that can be shared by different components of an application. So, for example if a data component that picked data from a database, it as a mutual service that could be use across over multiple applications.

In addition, Angular 2 has better event-handling capabilities, powerful templates, and better support for mobile devices.

2.12 Why We Choose Angular 2

In our project, we choose Angular 2 for developing our web frontend. Angular 2 is the updated version of JavaScript framework. It's very flexible than angularJS and ReactJS and some reasons discuss in below.

2.12.1 AngularJS or Angular 1

AngularJS is the most popular JavaScript framework to [14] build web applications. It was released by Google on October 20, 2010. Angular 1 is developed using TypeScript and JavaScript and uses traditional HTML. Angular 1 uses Controllers and Scope object.

Prerequisites: For start Angular 1 we must learn JavaScript and HTML only.

i. **Binding:** One-Way binding - required to use ng-bind for one-way data binding in Angular1

For Example:

Two-Way Binding - required to use {{message}} for two-way data binding in Angular 1.

For Example:

ii. **Bootstrapping:** There are two ways to bootstrap Angular app in Angular 1.

Via ng-app: <html ng-app=" myAngularApp"></html>

Via code: <script>

```
angular.element(document).ready(function() {
    angular.bootstrap(document,
    ['smyAngularApp']);
    });
</script>
```

iii. **Performance:** Angular 1 is slow if it used too many watchers in angular 1 app and need to reduce watchers to make it faster.

iv. **Mobile Support:** Angular1 is responsive but, does not have mobile support. It was not built for mobile devices. It is possible to run Angular 1 on mobile, but using 3rd party frameworks.

v. **Services:** There are various ways to create services in Angular 1 like Service, Factory, Provider etc.

2.12.2 Angular 2

Angular 2 is a version of Google's massively popular MVC framework for building complex applications in the browser. Angular 2 accompanies nearly all that are must create a complex frontend web or mobile applications, from powerful formats to fast rendering, data management, HTTP services, form handling, and so much more.

Prerequisites: learn Angular 2 – Typescript, HTML etc.

i. **Binding:** One-Way Binding. There are two techniques for one-way data binding in angular 2.

   i. Using Interpolation: {{message}}

   ii. Using Property Binding:

   There is an alternate syntax of property binding, which is known as canonical form.

   For Ex.

   Two-Way Binding- [(message)] are required to use parenthesis inside of brackets for two-way data binding in Angular 2.

   For Ex. <div [(ngModel)] =" message" >

   This is a combination of Property binding & Event binding.

ii. **Bootstrapping:** This process has been changed in Angular 2. Here we connect angular components to view, not modules.

```
import {bootstrap} from '@angular/platform-browser-
dynamic';
import {AppComponent} from './app.component';
bootstrap(AppComponent);
```

iii. **Performance:** Angular 2 is 5 times faster than Angular 1. It is using dependency injection system which is major performance booster.

iv. **Mobile Support:** Angular 2 is mobile oriented. It is designed from ground up with mobile support using Ionic Framework.

v. **Services:** Components shouldn't fetch or save data directly. only focus on presenting data and delegate data access to a service. Angular 2 dependency injection to inject it into the Component constructor. There in the only way to use Service in Angular 2.

2.12.3 ReactJS

React is a JavaScript library created to build User Interfaces. It is supported by Facebook and Instagram, and has turned into a core technology in the endless feed of these two applications. As a JS library, react has quite a limited sphere of usage, yet when packaged with different libraries it turns into an effective solution, which nowadays is one of [15] the main competitors of Angular. Deference between Angular 2 and ReactJS (Please see Table 2.1) as shown below.

Table 2.1: Angular 2 vs ReactJS

Angular 2	ReactJS
Angular 2 developed by Google.	ReactJS developed by Facebook and Instagram.
Fully featured MVC Framework written in JavaScript.	Open source JavaScript library (view in MVC, requires Flux to implement architecture).
Brings TypeScript into HTML, Works with the real DOM, Client-side rendering.	Brings HTML into JavaScript, Works with the virtual DOM, Server-side rendering.

Two-way data binding.	One-way data binding.
Manages dependencies automatically.	Requires additional tools to manage dependencies.
Language are TypeScript + HTML.	Language are JavaScript + JSX.
Angular 2 has component based app architecture.	ReactJS has no architecture. It combined with Flux.

Here, ReactJS is not a full-scale framework and for this very reason integration of the UI library into a common MVC framework requires good programming knowledge:

i. **Need to use third-party technologies:** As already said, ReactJS is a JavaScript library, not a structure. Therefore, its possibilities are limited. To expand the functionality, it is important to use third-party modules and libraries.
ii. **Using JSX:** React suggests using JSX rather than standard JavaScript and HTML. This is JavaScript, but extended with XML syntax. The creators claim that JSX is faster, more secure and easier than JavaScript.
iii. **Complex application structure:** React doesn't have any predefined structure. This means that structuring the application is fully the responsibility of the developer, and depends on developer's knowledge and experience.
iv. **Steep learning curve:** React isn't the easiest technology to learn, and need to get to know several other libraries and modules as well.

For that reasons we choose Angular 2 for developing a robust web Application. and angular 2 achieve a leading position in industry market.

2.13 Version Controlling

We use Bitbucket for source-code-control, project-management, and team-collaboration. Bitbucket is a web-based hosting service that is owned by Atlassian,

[16] used for source code and development projects that use Git revision control systems. Bitbucket offers both commercial plans and free accounts. It offers free accounts with an unlimited number of private repositories. Bitbucket integrates with other Atlassian software like Trello, Jira, HipChat, Confluence and Bamboo. It is like GitHub, which primarily uses Git. Bitbucket is mostly used for code and code review. Bitbucket supports the following features:

i. Pull requests with code review and comments.
ii. Merge Checks if commits were conflict.
iii. Huge Storage for create Repository.
iv. Documentation, including automatically README files for easy to understand the code.
v. Issue tracking in the repository.
vi. Static websites hosted on bitbucket.io domain in their URL.

2.14 Work Flow Management

Trello is a visual collaboration tool that creates a shared perspective on any project. Trello is an awesome project management tool that makes collaboration is too easy [17]. But this visual list tool can do so much more, organizing work, task assign, manage assignment schedule. Trello's boards, lists and cards enable to organize and set priority of the work. And it gives more flexible, and best way to do these works. A Trello board is basically a web page containing lists laid out horizontally on the page. Items within the lists, called cards, can be dragged and dropped onto other lists or reordered within lists. Individual cards themselves can contain checklists, images, attachments, deadline dates, colored labels, and discussion notes from others who share the board. Trello cards are like sticky notes and arrange on a cork board - that is, digital sticky notes that are searchable, shareable, and come with reminders.

2.15 Exiting Projects

In our Bangladesh, many systems are developed and working as a helping hand for normal public. It's going to be good. But has a problem, one system for one service. It's very irritating for using. Because many apps installed in our device for getting their service. In below we discuss about some exiting systems in Bangladesh.

2.15.1 National Help Desk 999

Bangladesh Telecommunication Regulatory Commission has decided to allocate a three-digit short code '999' to the ICT division of the Ministry [18] of Post, Telecommunications and Information Technology for using as its national help desk number. "This helpdesk number is toll-free," according to an allotment letter signed by BTRC on September 5.

i. There are just a few people who are following anyone on the street alone. It would have been good to get help from the police immediately. But his/her don't have any number of nearest police station. There is no way to find out the number of police apps from the police because his/her have a normal phone! Dial 999 at and just want to cooperate with his/her position, they will do the rest. The police will come to see them.
ii. Midnight The family has become seriously ill. Emergency ambulance will take place. Not known anyone is calling the phone Very dangerous. Please dial 999 at and the ambulance will be available at the home gate.
iii. Next house has a fire? Do not have a fire service phone number? Need to fire quickly. Do not understand what to do? Mean time mobile balance is over! Dial Toll Free 999. Fire service team will reach.

If someone gives wrong information. Everything will be recorded. Legal action will be taken against the call from the phone.

2.15.2 Voice Beta Version

Voice is the new service for Bangladeshi peoples. It's created by a private company and supported by a ICT Division [19]. VOICE authority follows the mission- "Inform any inconsistencies with images to authorities concerned through VOICE Application instantly". By using VOICE now it's easy & suitable way to send report along with location. In first time When start the application, find accounts on the device and input users name the application will start. It's mean one kind of – users account signup for getting the services. Then users get all services which VOICE has. VOICE will not publish for public. But the release a beta version for check users and application feedback. The authority added application features like:

i. News about social affairs.
ii. Emergency nearby numbers like Police, Hospital, Ambulance.
iii. Call Center.

2.15.3 BD Police Helpline

Bangladesh Police is the premier law enforcement agency of the Government of the Peoples Republic of Bangladesh. Bangladesh police has already [20] taken various initiatives to deliver service to the peoples. Because, the vision 2021 of the Government to build a Digital Bangladesh.

Mobile application is the one of the handiest way to communicate to peoples using internet. And the application designed to let all peoples to build up a connection with Bangladesh police by providing any information the peoples feel needed to send to the report to Police. Bangladesh Police committed to response and take necessary steps to solve all reports and take care the reporters. Police feedback will be available to all users of the application as public information. When users send a report for getting help they can attach picture and location. Users can be login and login as anonymous to getting the service.

2.16 Difference

We see many websites in the internet and find out the three applications. We explained three services which is exiting in Bangladesh name - National Helpdesk 999, VOICE, BD Police Helpline. In the bellow, we discuss about what is difference features from these systems.

Service Area:

i. These services provide helps to users which service is surrounded Police, Ambulance and Hospital. That's good, but we face many other problems except these.
ii. In our service system, peoples will be getting many services like waste cleaning by City Corporation, Any services by Private company or NGO's, additional with Police and Hospital services.
iii. Every Company or NGO's can sign up for provide their service. Example, a company or NGO start a journey with public services and their mission is providing help to their candidates on problems.

Reporting:

i. Exiting Service system takes user information like name, email or phone number. For that reasons, many users feel insecure (Specially report to Police) when it's exposed to public. At last they didn't send any report to police. Only BD Police Helpline follow the proper way to hide the reporter's information because they give an option to users like- Login as Anonymous.
ii. In our service system, User's just open the mobile application and follow the rules to send a report. User's don't have any account and don't give any information. Firstly, users select the service category and if user's have a specific service providers (optional) then just choose. Secondly, user's input report subject, report message and attached location. And users also attached a media file.

CHAPTER 3

PROJECT METHODOLOGY

3.1 Requirement Finalization or Functionality

Here we divide this section for some part these are problem Identify, UML Diagram, Entity Relationship Diagram, System Design (Font-end and Back-end) and lastly testing. Some of these peart we already discuss before of this chapter and some of others bellow of these chapter. In the picture, we saw the main design of methodology that means which part we follow.

3.1.1 Problem Identify

In Dhaka, road and dustbin becomes dirty. In Eid al-Adha, animals are sacrificed at Qurbani by Muslim people. That time roads become very dirty by Qurbani wastes. City corporation is taking many steps to clean up these wastes and they cleaned waste. Sometimes, they miss some area to cleaning, because they can't scan all areas. This area spreads dirty smell of wastes. On the other hand, they are messaging all people and provide a hotline number for complain about to city corporation, but this is irritating. And many private company or NGO's will start their journey with helping hand to public. But they provide a hotline number to public for communication. We always face these types of problems. Once day we think how to solve it. And after a certain period, we find out a process to solve these problems through online. We will create a web application for "Service Providers" and mobile application for "Service Seekers".

If our application is live, then people open our application and easily report to the service providers with their problems. It's very helpful for service providers to

take immediate step against this report. Mean time we think about reporter's identity how to keep safe.

3.1.2 Features

In this section, we will discuss about all features of our clients and users. In here, Clients means Service Providers and User's means Service Seekers.

Clients

i. Must be Registered and Logged in
ii. Reduce money cost.
iii. Pay only Internet charge.
iv. Make a best country in the world.
v. Give better service to people.

Users

i. Don't create account.
ii. Submit report to get services.
iii. Pay only Internet charge.
iv. Send feedback about their opinion.

3.2 Unified Modeling Language

UML is a method for visualizing a software program using a collection of diagrams. UML is accepted by the Object Management Group (OMG) [21] as the standard for modeling software development. Here we create use-case and activity diagram only for our project.

3.2.1 Use Case Diagram

A use case diagram is a graphic depiction of the interactions among the components of a system. Use case diagrams are utilized in UML (Unified Modeling Language), a standard notation for the modeling of real-world objects and systems [22]. A use case diagram contains four parts.

i. The boundary, which defines the system of interest in relation to the world around it.
ii. The actors, usually individuals involved with the system defined according to their roles.
iii. The use cases, which are the specific roles played by the actors within and around the system.
iv. The relationships between and among the actors and the use cases.

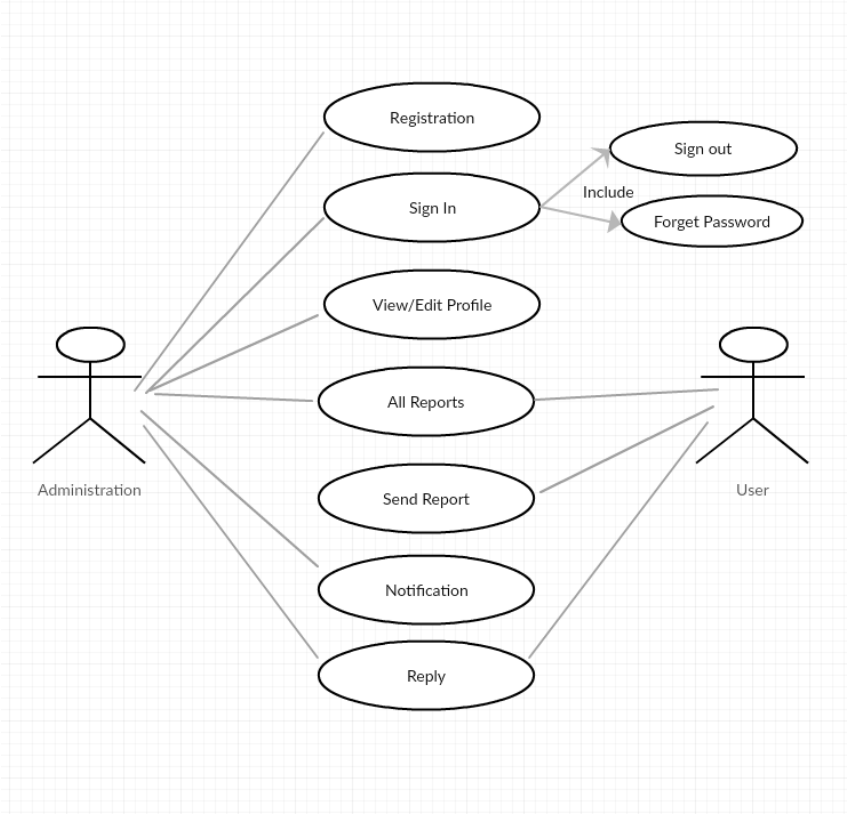


Figure 3.1: Use Case Diagram

In the following diagram (Please see diagram in Figure 3.1), here has two actors. One is Administrator, and another is User. Administrator which can do is the system. Like- Registration, login, view or edit own profile, see all reports, get a notification from users, send and get reply for specific reports. On the other hand, users can do these like see all reports, send report and send and get reply specific reports.

3.2.2 Activity Diagram

Activity diagram is another essential behavioral diagram in UML diagram to expose dynamic perspective of the system. Activity diagram is basically an advanced form of flow chart that modeling the flow from one activity to another activity. Activity diagrams can be developed in different degrees of detail. In the external view, activity diagrams, just like use case diagrams, exclusively represent business processes and activities from the outside perspective.

Activity Diagram for User:

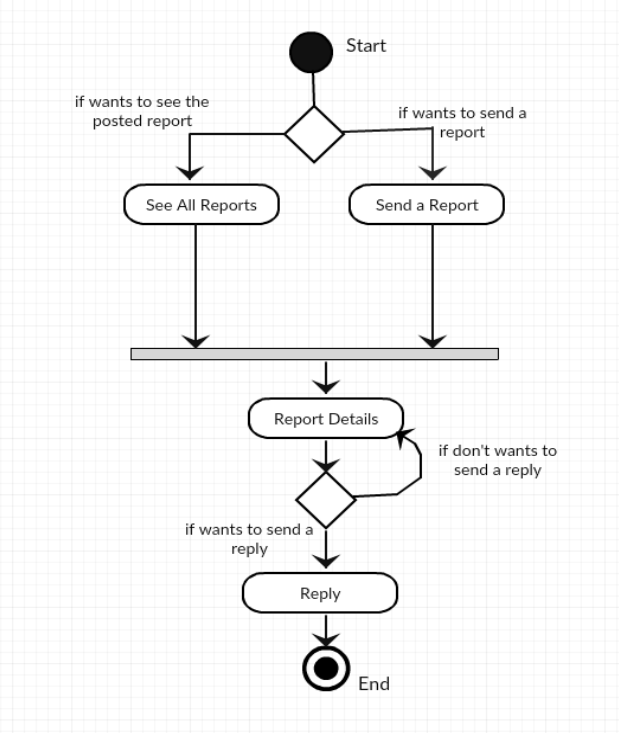


Figure 3.2: Activity Diagram for User

In activity diagram (Please see diagram in Figure 3.2), when user open the mobile application he/she see the two options. One is see all report, and another is Report an Issue. He/ she choose which want. Then go to the report details. If he/she send any reply for this report then he/she can do it.

Activity Diagram for Administrator:

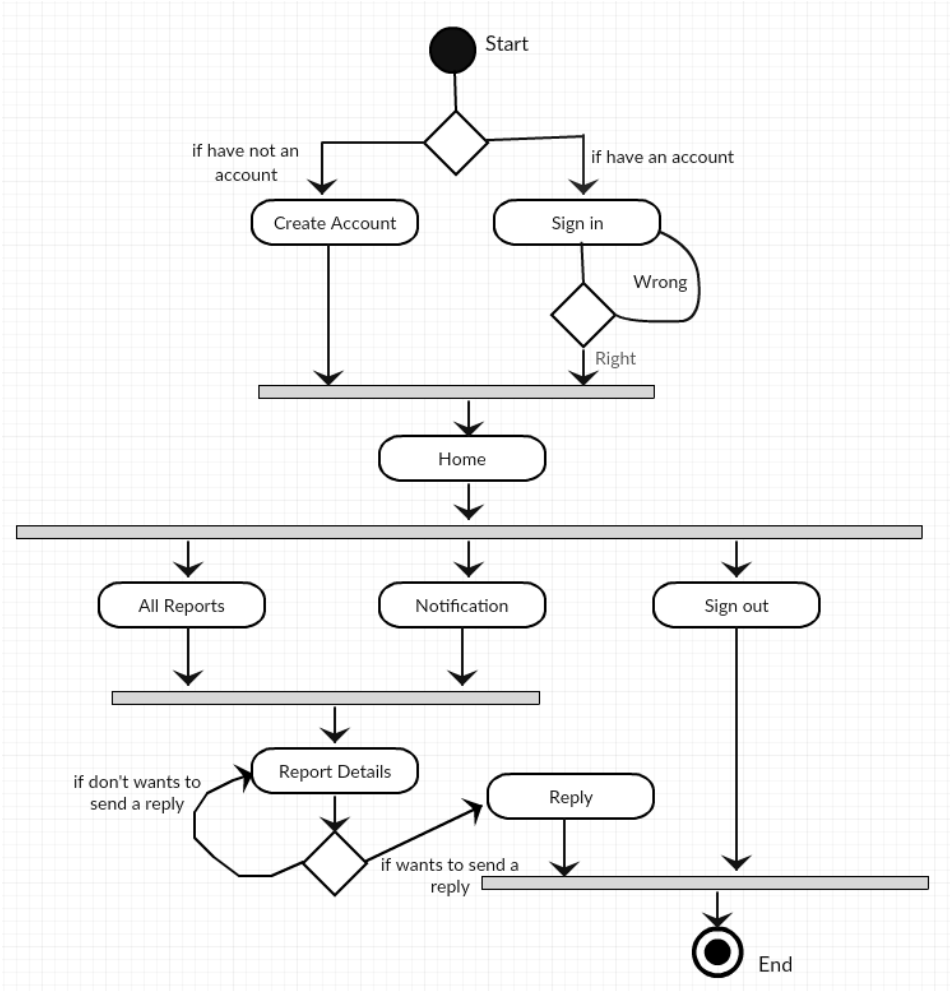


Figure 3.3: Activity Diagram for Administration or Service Provider

In the following activity diagram (Please see diagram in Figure 3.3), firstly administrator go to sign up or sign in option which his/her needed. If enter wrong username or password, then back the sign in page. After signing in go to the home page. In home page section, administrator see the all report, notification and sign out option. If administrator wants to see any report details, then click on any report and see the report details. And wants to send any reply then he/she can do it.

3.2.3 Database Diagram

The database diagram of a database system is its structure described in a formal language supported by the database management system. The term diagram refers to the organization of data as a blueprint of how the database is developed.

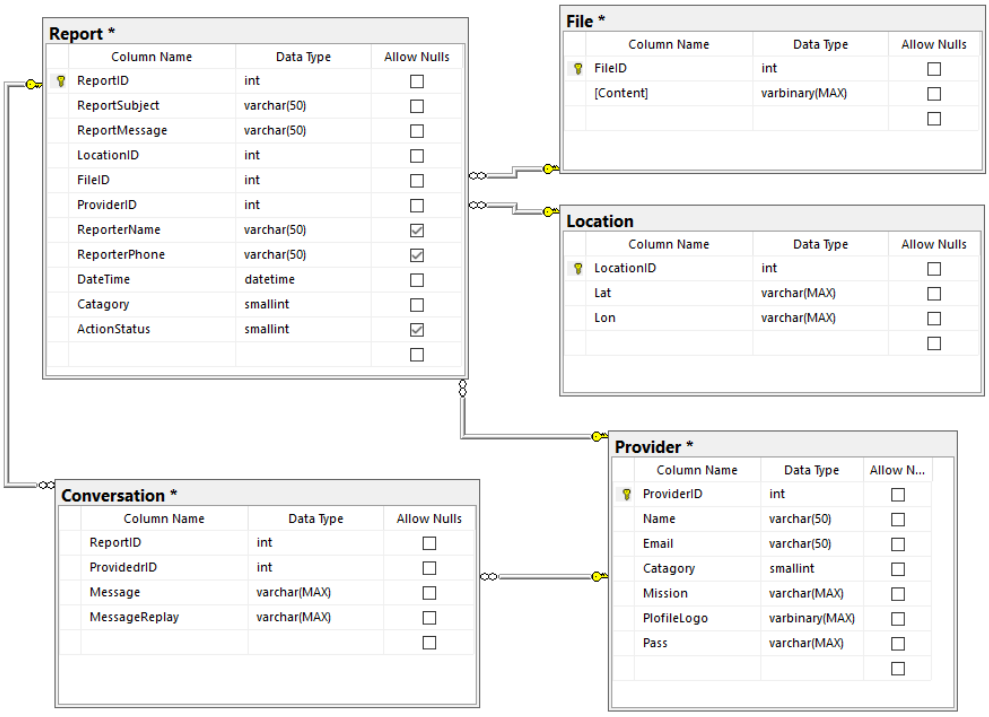


Figure 3.4: Database Diagram Generate with MS SQL Server Studio

In Figure 3.4, we use five tables in SQL database. Each table related with Report table. In details, when submit a report firstly insert the image and location in the File and Location table then the FileID and LocationID input the Report table. Conversation table store data when anyone replies on reports. That time Conversation table store the ReportID. When any Organization create account, these data store in the Provider table. Here, we use varbinary for image, varchar for string, int for ID, smallint for declare enum in this database.

3.3 User Interface

This section we divide by three parts. First part is Landing Page, second part is Web Application and third is Mobile Application.

3.3.1 Landing Page

In Landing Page, we represent the service like what's the work, what's the rules to submit report, what's the business strategy, how many clients we have etc. and introduce our mobile application which use for posting any reports and provide mobile application download link. This Landing page play a role to know everyone about the service.

Figure 3.5: Home Page of Hotline Service Landing Page

This Landing Page is we see the navigation items like Home, Services, Clients, Price, About Us, Contact and Join with us in navigation bar (Please see screenshot in Figure 3.5). Here anyone click on these navigation items and see details about the service. If anyone want to get the service then click on Join With Us, and goes to the Angular Web Application for Create Account.

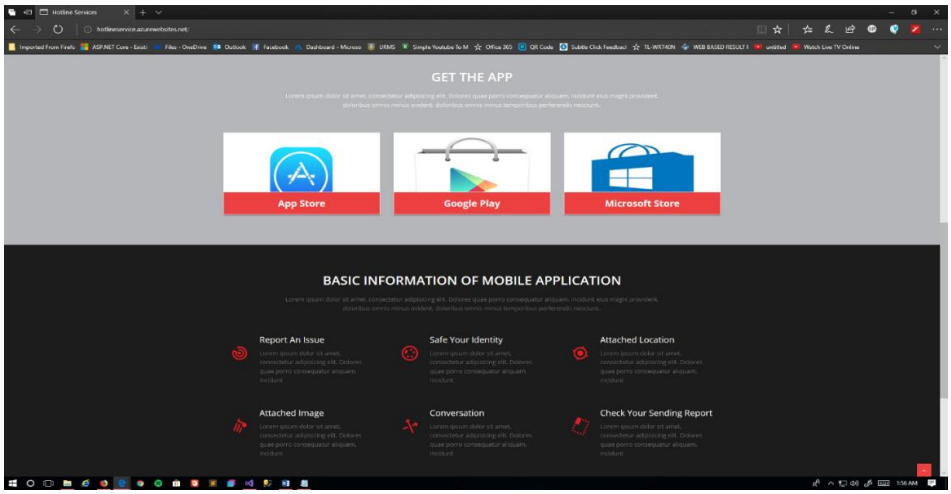


Figure 3.6: Get the App and Basic Information

In this Page, we provide mobile apps download link to user (Please see screenshot in Figure 3.6). Also, we give some basic information about these mobile apps to the users. User can gather an idea about the mobile application like how to submit report an issue, safe identity, attached location, attached image, conversation and tracking on report.

3.3.2 Web Application

In Web Application, any organization can create their account and use this service. It's only for organization or administration. After signing in, organization can see the submitted reports from peoples, they can see the report details and send their feedback on any report.

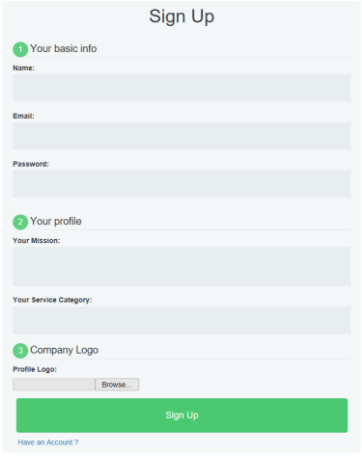


Figure 3.7: Sign up Page on Web Application

This is the sign-up page for Administrator (Please see screenshot in Figure 3.7). Here they provide their name, email, password, write about their mission, service category and their organization logo and click on the sign-up button. If they have a registered account, then click on the “Have an Account” and go the sign in page.

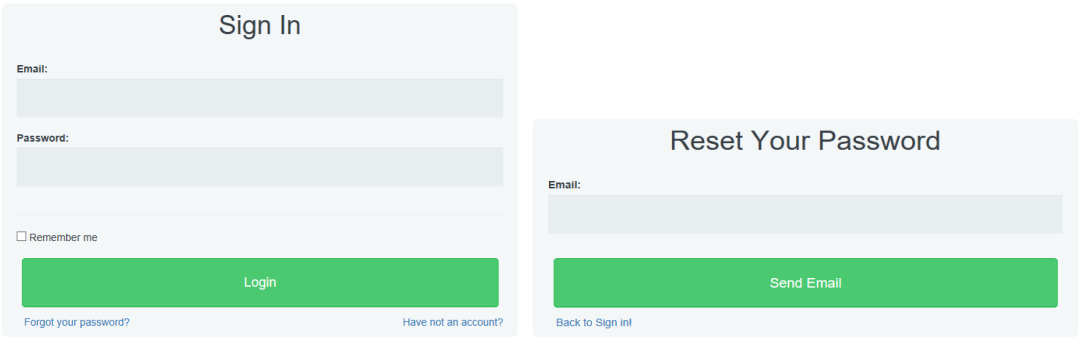


Figure 3.8: Sign in and Forget Password Page on Web Application

In Figure 3.8, first is sign in page and another is reset password page. In sign in page, administrator give their registered email and password then click on the login button. If these are correct then go to the home page else email and password are incorrect then can’t go the home page and see an error message like “incorrect email or password”. If they forget their password, then click on “Forgot your Password” and go to the reset password page. Here administrator give their registered email and click on the “Send Email”. After they get a password reset link in this email inbox.

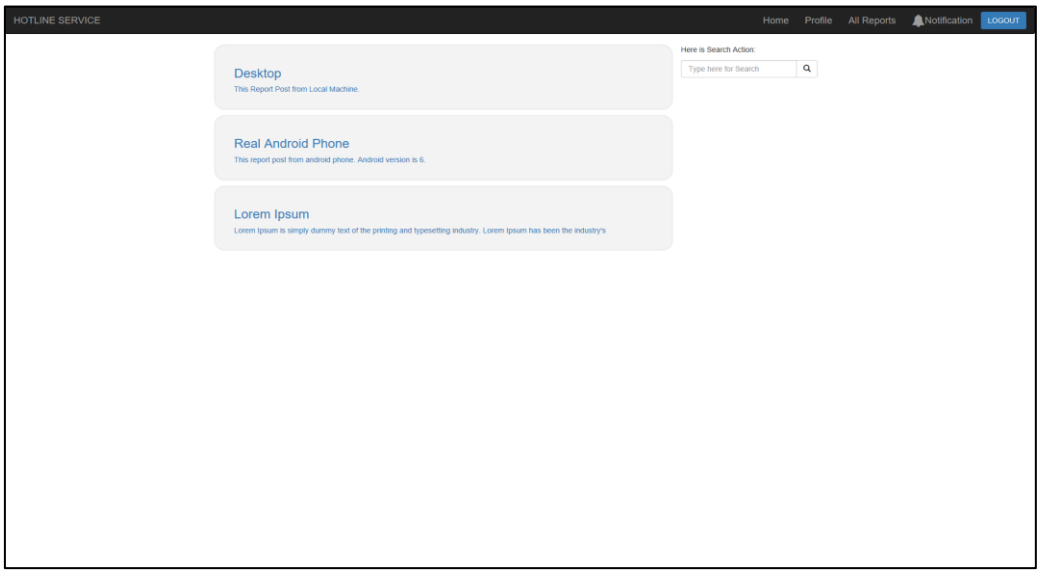


Figure 3.9: All Reports Page on Web Application

After signing in, administrator go to the home page. In home page, they can see the all submitted reports (Please see screenshot in Figure 3.9). In screenshots, there are some reports as list. In the list view, first line is report subject and second line is report message. Right side has a text input, they can filter the report lists by typing the report subject.

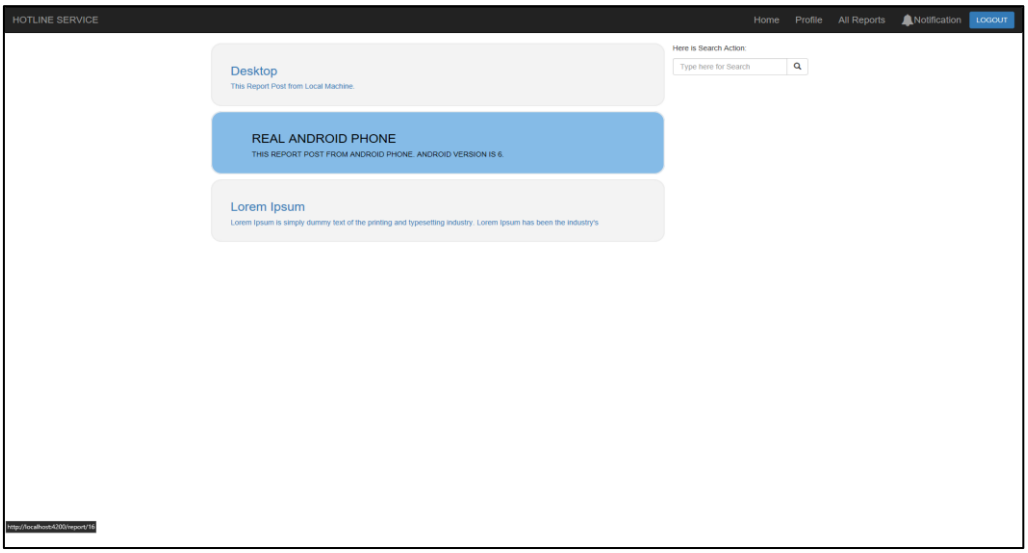


Figure 3.10: Hovered Report on Web Application

When administrator hover on any reports, the list view become blue color and all character are become uppercase (Please see screenshot in Figure 3.10). Report subject and report message are become black color.

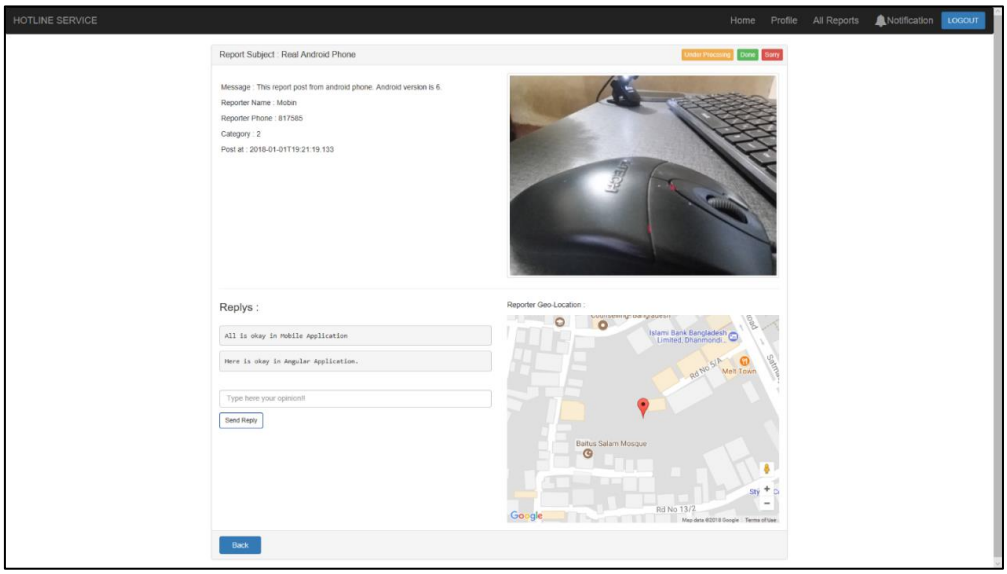


Figure 3.11: Report Details on Web Application

This is the report details view. Here administrator see the all details about submitted report like report subject, report message, reporter name, phone number, attached image, attached geo-location and replies for this report (Please see screenshot in Figure 3.11). In below they see a back button to go to the previous page.

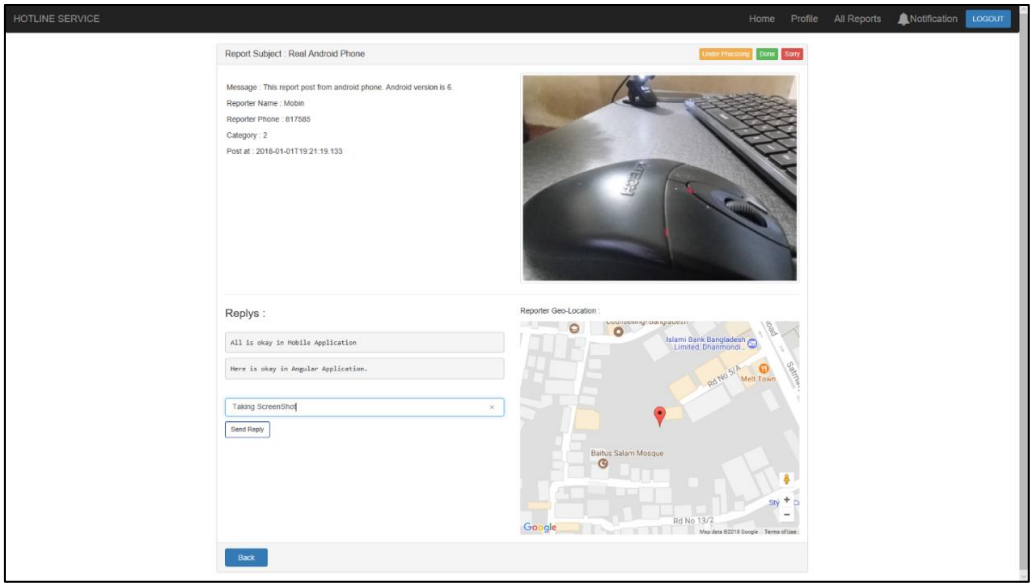


Figure 3.12: Write Reply on any Report

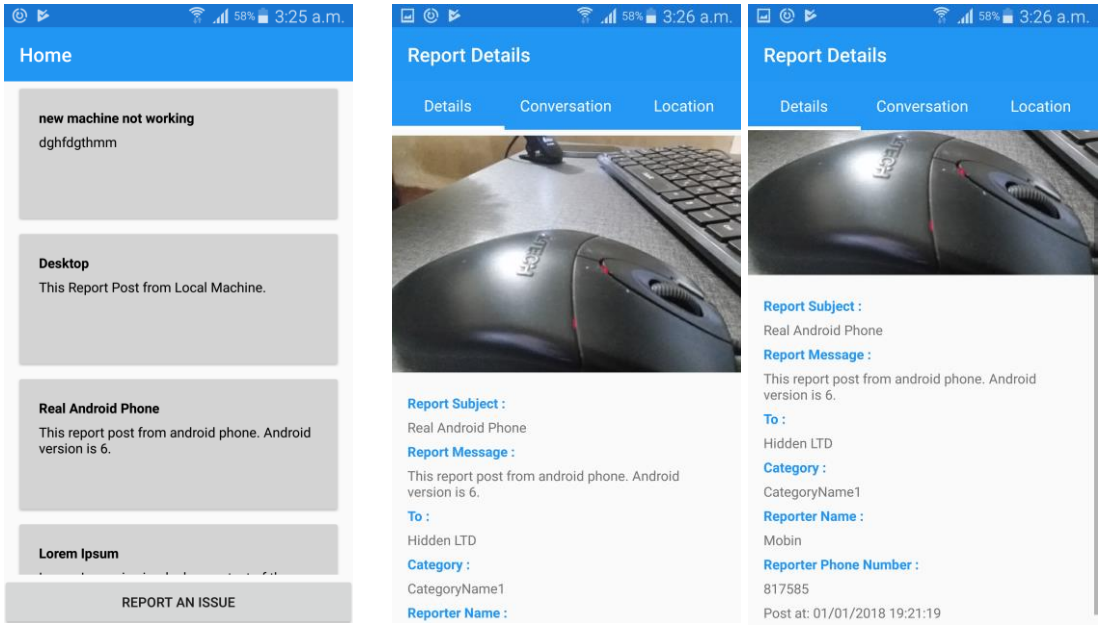
Here they can send any replies, if they want then to write something in the input field and click on the “Send Reply” button (Please see screenshot in Figure 3.12). After clicking, they see their replies and peoples get their replies on mobile application. And another thing is administrator send their action status to the reporter like under processing, done and wrong reports. This section is in the panel heading behind the report subject.

3.3.3 Mobile Application

In this section, we show our mobile applications user interface. we developed mobile application using Xamarin forms technology. It’s cross-platforms, and we develop the mobile application like Android, Windows and iOS. So, we divide by three parts. One part is Android Apps, second part is Windows Apps and third is iOS Apps.

3.3.3.1 Android

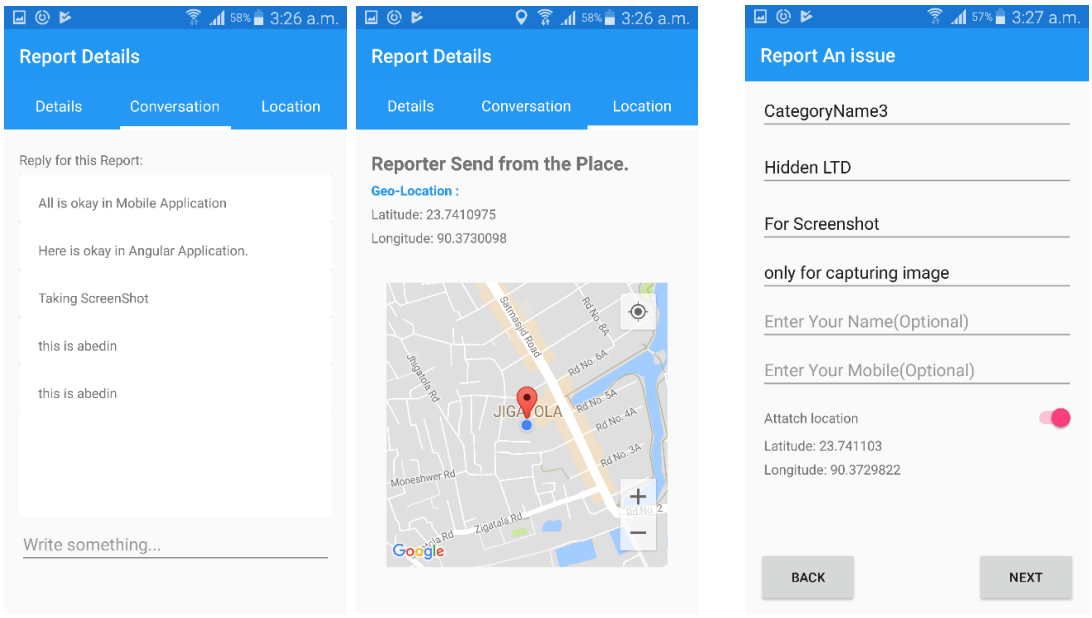
This android mobile application run on real Android phone and Android version is 6.01. This application run to able from Android version 4 to Version 7.



(a) Home Page (b) Report Details

Figure 3.13: Screenshots of Android Apps

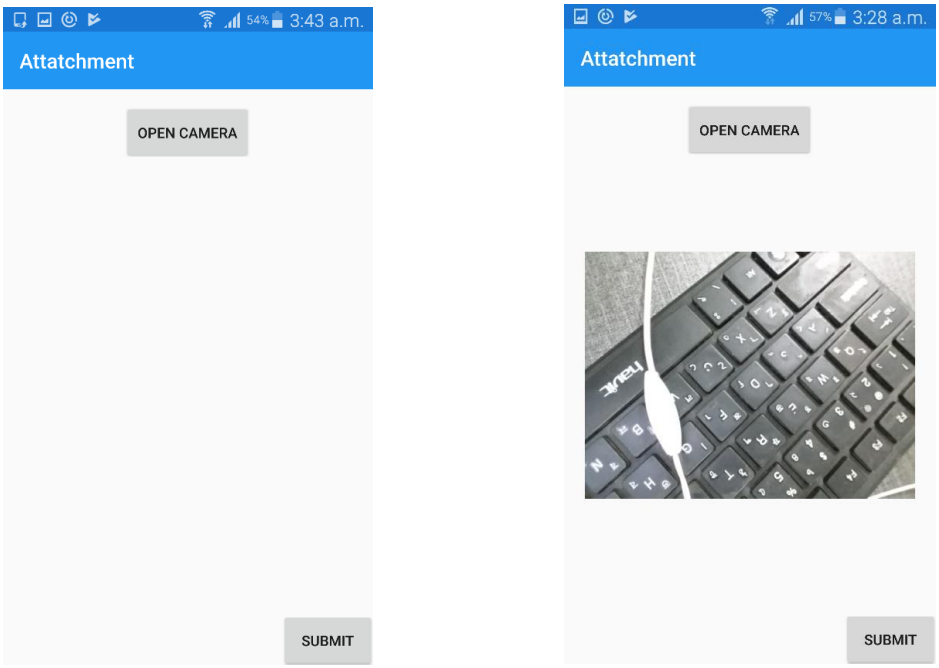
Here we add three screenshots of android mobile application. Figure 3.13 (a) is the Home of the application. in Home users see the all reports as a list view. In below has a button name “REPORT AN ISSUE”. If anyone send a report then click on this button. If anyone see the report details, then click on the report and go the report details page Figure 3.13 (b). In report details has three tabbed view “Details”, “Conversation” and “Location”. In Details Tab, user see the attached image, report subject, message, to means which organization, service category, reporter name, phone number and submitted date time. If reporter didn’t provide name or phone number then Label will be show “Reporter Feels Insecure, And He Says Sorry to This”.



(a) Report Details (b) Issue Report

Figure 3.14: Screenshots of Android Apps

In Figure 3.14 (a), Conversation Tab, user see the all replies for the report. If user wants to send any reply, then write something on the textbox. Writing in textbox when character is large than 4 then comment button is arise. In Location Tab, see the attached location in the google map. In Figure 3.14 (b), Report an Issue page, this is the report submission form. Here user add all information about his/her report like service category, organization, report subject, report message, name, phone number and on the switch toggle for attached location then click the “Next” button.



(a) Take Photo (b) Image Viewer

Figure 3.15: Take Photo and Image Viewer Page of Android Apps

After clicking the “Next” button then go to this page Figure 3.15 (a). Here user click on the “Open Camera” for capture an image. After capturing Figure 3.15 (b), then click on the “Submit” button.

3.3.3.2 Windows 10

This windows application run to able from version Windows 10 November update to version Windows 10 Fall Creators update. We have no Windows Phone so, we run the application in Visual Studio Windows 10 Emulator and take screenshots (Please see screenshots in Figure 3.16).

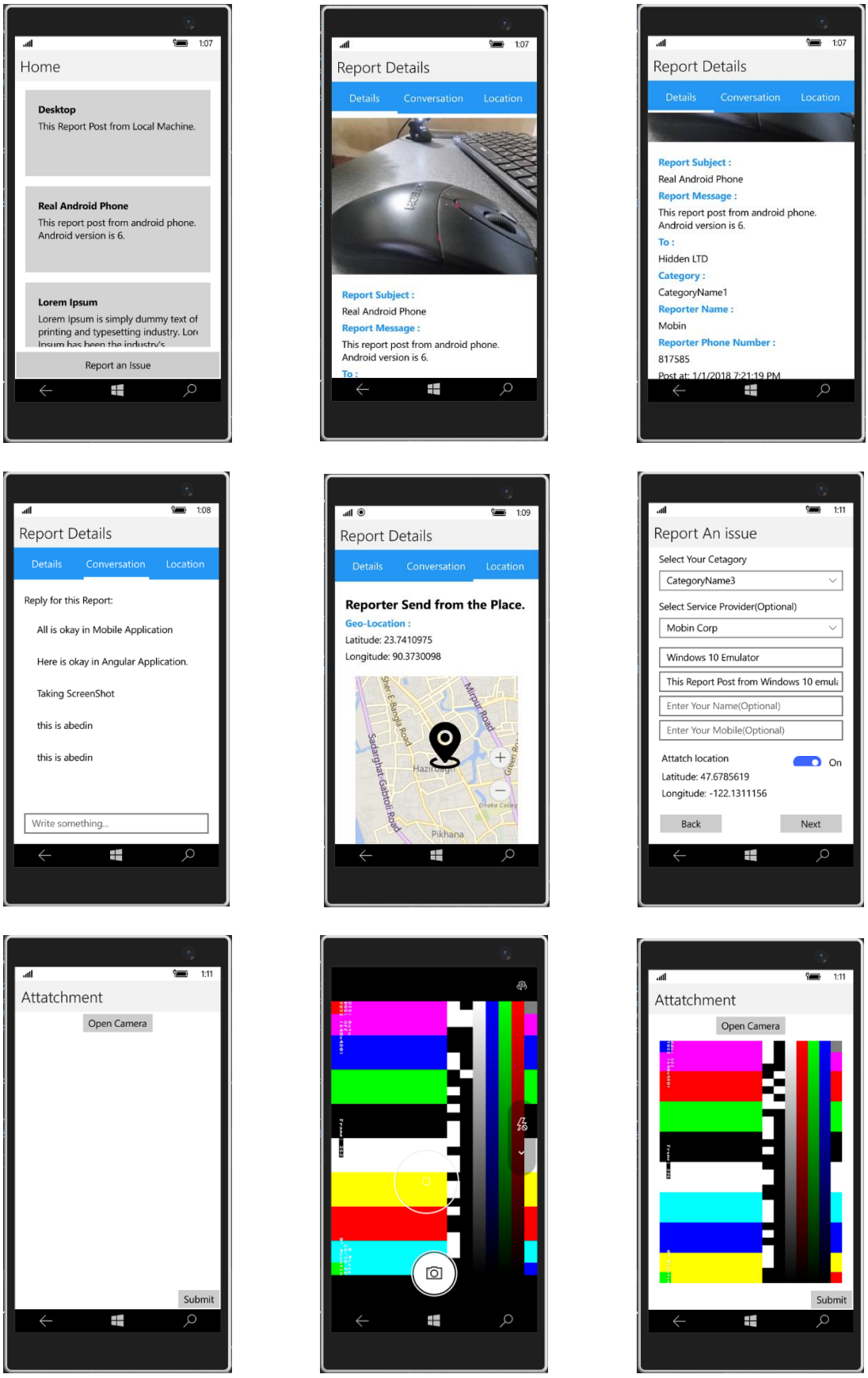


Figure 3.16: All Screenshots on Windows 10 Emulator (Visual Studio)

3.3.3.3 iOS

Xamarin for Windows allows iOS applications to be written within Visual Studio, with a networked Mac providing the [43] build and deployment service. We can’t run the iOS mobile application on iOS. Because we have no macOS device and without macOS is not possible to run on iOS device.

CHAPTER 4

IMPLEMENTATION

4.1 Development Process

In this section, we describe which development process we follow. We follow the scrum process in our development. Scrum is an agile way to deal with a project, for the most important part in software development. Agile software development with Scrum is regularly seen as a methodology; but instead than survey Scrum as procedure, consider it as a framework for dealing with a development process. This is the reason in Scrum development, for example, [23] a sprint planning meeting is described in terms of the commitment to a set of features to be developed in the next sprint. Scrum depends on a self-organizing, cross-functional team. The scrum team is self-arranging in that there is no general group leader who chooses which person will do which task or how an error will be solved. Those are issues that are chosen by the whole team.

In Scrum, a team is cross functional, meaning everyone is needed to take a feature from idea to implementation. Inside agile improvement, Scrum teams are supported by two individual parts. The first is a Scrum Master, who can be thought of as a mentor for the team, helping team members utilize the Scrum procedure to perform at the highest level. Scrum process advocates for an arranging meeting toward the begin of the sprint, where team members make sense of what number of things they can commit to, and then make a sprint backlog - a list of the tasks to perform during the sprint. During an agile Scrum sprint, the Scrum group takes a little set of features from plan to coded and tested functionality. At the end, these features are done, which means coded, tested and merge into the developing item or system.

On every day of the sprint, we should attend a weekly Scrum meeting with supervisor. This meeting is time boxed around 15 minutes. During that time, we share

what done at the week, will work on that week, and identify any obstacles to progress. Here we divide our project into three sprints:

i. First Sprint - Web API.
ii. Second Sprint - Xamarin Forms Mobile Application.
iii. Third Sprint - Web Application

4.1.1 First Sprint

In the first sprint, we developed web API for our project. It's the most important part in developing for multiple platforms. The first sprint takes probably one month.

In this sprint, we (me & my honorable supervisor) complete a general meeting and paper work about the project. Which thing have, which are not and what language and technology are using in our project. Firstly, we complete a paper work and represent a primary structure what' going on. Next, we create a database in Microsoft SQL Server using SQL language. How many table are here, how many rows or parameters for each table, and define the data type and set data limits. Next, we create a shared project for define the models. We create it separately because rapidly use these model in upcoming projects. Then we create a ASP.NET Core web API project. Then we configure the project settings and start the main work. We declare HTTP POST methods which data are sending to the server and declare the HTTP GET methods which data are retrieve from the server.

At last, we face a problem when we call the API from Angular 2 web apps. It shows an error like Unknown URL. Because CORS was disable in API project. After we enable the CORS then we get all JSON data through API [See details Section 4.2.2.3].

4.1.2 Second Sprint

In second sprint, we only focus on mobile application because we decide to develop a cross-platforms mobile apps, and it's a big challenge for any developers**.** When we are working on the first sprint, mean time we start working on the second sprint for API testing purpose because it works or not. If we are using POSTMAN software for API testing it takes more time. Otherwise it seems to me boring. Whereas we develop the mobile application so, firstly we start working on xamarin forms application for API testing. In the first step we create a project on cross-platforms mobile using Xamarin.Forms. then add the created models shared project as a reference project. Then we install JSON converter tools [See details Section 4.2.1.2.1].

Next, we create a some XAML file for design user interface and a class file for API call. Firstly, we work on post a report through API. But we face a problem in this step. And problem is when we post a report, we input category, provider name, report subject and report message first page and click on "NEXT Button" then go to next page and capture a picture then submit. But we can't get the value which inputted from first page. Then we create a class which stored temporary value. Like when we click on next button then these data stored temporary in this class. Then we capture a picture and before click to submit button we retrieve that values from temporary class and send to server with pictures. This problem takes 3-4 days to solve it. Next, we detected our geolocation. For this work we are using a plugin or tools name Xamarin.Plugin.Geolocator and work following the plugin documentation. Then we send to server with reports [See details Section 4.2.1.2.1]. Then we work on open camera and take a picture. For this we need to install the NuGet name Xam.Plugin.Media. and using namespace Plugin.Media. we follow the NuGet packages documentation [See details Section 4.2.1.2.1]. Next target is show the different map for specific platforms. for this we installs the tools name Xamarin.Forms.Map and configure our project following the plugin documentation. This is challenging task for us [See details Section 4.2.1.2.1].

After, we retrieve the reports data and show on the home page. Then we show the specific report details on a page. Like when click on a report to see the information it goes to the report details page.

4.1.3 Third Sprint

In third sprint, we start work on angular2 web application. In angular2 web apps we need to know Typescript language, and it is the first-time experience using Typescript. So, it is very difficult to developing web apps for us. But we have to developing this for requirements. Firstly, we clone a quickstart angular 2 project from GitHub. First 3-4 days we utilize the whole projects and observe "How to work angular 2 web apps?". Then we are starting work to our destination. Secondly, we design our web apps user interface then we are working on angular2 project. Next, we create all components and html file which are required for the UI design. The we work on page routing [See details Section 4.2.1.3]. Third, we start work for getting JSON data through API. For these, we create a file name API SERVICE. For API service to needs HttpClient and HttpErrorResponse module. We fall in a trouble when we call the API in web apps. When we run the project, its show an error.

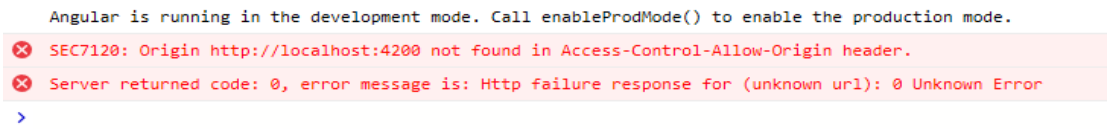


Figure 4.1: Error for Cross-Origin Resource Sharing

Then we search about the error in internet (Please see screenshot in Figure 4.1). After a long time, we get the solution, and this problem in our ASP.NET Core web API project. Next, we enable CORS in API project [See details Section 4.2.2.3]. After that, we get all JSON data from API. The we need to bind these data with HTML. Fourth, we need to implement a map for see the reporter's location. For that, we use Angular Google Map [See details Section 4.2.1.3].

4.2 Technology Selection

In our research project, we work on three individual projects. First is Website, second is Web Application and third is Mobile Application. In our working process, we divide by two parts. One part is front-end for client side and second part is back-end for server side. Client side is view part what users see.

4.2.1 Front-End

This section, we divide by three parts. One is Landing Page, second is Web Application and third is Mobile Application.

4.2.1.1 Landing Page

In the Landing Page, we use a bootstrap (version: 3.1.0) template for design this website. Than we create our own HTML pages which we are planning. We use HTML for view which clients can see and use features which needed. CSS use for designing this website (color, font, spacing etc.). we also use Font Awesome (Version: 4.7.0) icon for beautification.

4.2.1.2 Mobile Application

We use Xamarin Forms [version: 2.5.0.91635] for developing the mobile application. For this we use XAML to build up the user interface. XAML uses for a representation of containers and what can users see, and use features whish needed. Using XAML tag is Button, Switch, Entry and Label etc. XAML also uses for designing the mobile application (color, font, spacing etc.). Here, we use StackLayout, Grid, RowDefinition, ColumnDefinition, HorizontalOption and VerticalOption etc.

In code behind, we are using C# (.NET Framework 4.6.1). Code behind means, each .xaml file has a xaml.cs file. In a XAML file (with business logic defined in the associated xaml.cs file or better definition for Bindings to a ViewModel). xaml.cs file called as code behind. In xaml.cs file, we implement our logic, call the API, get data and send data through API.

4.2.1.2.1 NuGet Package or Tools

A fundamental tool for any modern development platform is a component through which developers can make, share, and expend valuable libraries of code. Such libraries are regularly referred to as "packages". [24] NuGet is the packages administrator for .NET. The NuGet customer tools give the capacity to create and consume packages. The NuGet Gallery is the focal package store utilized by all package creators and consumers. Here we add these NuGet's which are used in the mobile application.

i. JSON Converter

First, Install-Package Newtonsoft.Json [version: 10.0.3]. With the [25] Newtonsoft.Json package in the project, and call it JsonConvert.SerializeObject method to convert an object to a human-readable string. For simple scenarios where need to convert to and from a JSON string, the SerializeObject() and DeserializeObject() methods on JsonConvert provide an easy-to-use wrapper over JsonSerializer. Here, we show a sample Code as shown below:

```
Product product = new Product();

 product.Name = "Apple";
 product.ExpiryDate = new DateTime(2008, 12, 28);
 product.Price = 3.99M;
 product.Sizes = new string[] { "Small", "Medium", "Large" };

 string output = JsonConvert.SerializeObject(product);
 //{
//  "Name": "Apple",
//  "ExpiryDate": "2008-12-28T00:00:00",
//  "Price": 3.99,
//  "Sizes": [
//    "Small",
```

```
      //    "Medium",
      //    "Large"
      //  ]
      //}

Product deserializedProduct =
JsonConvert.DeserializeObject<Product>(output);
```

ii. HTTP Client

HTTP Client means HTTP call by client side. Provides a programming interface for modern HTTP applications, including HTTP client components that allow applications to consume web services over HTTP and HTTP components that can be used by both clients. and Provides a base class for sending HTTP requests and receiving HTTP [26] responses from a resource identified by a URL. Install the NuGet package name System.Net.Http [version: 4.3.3] in all projects. And add the namespace, using System.Net.Http and sample code as shown below:

```
public class ApiClient
    {
        private string _apiRoot;
        private string _report = "report";
public ApiClient()
        {
            _apiRoot = "http://serviceappbackend.azurewebsites.net/api";
        }
//PostAsync Method
public async Task PostReportAsync(Reports report)
        {
            string url = string.Format("{0}/{1}", _apiRoot, _report);
            var httpClient = new HttpClient();
            var stringContent = new
StringContent(JsonConvert.SerializeObject(report), Encoding.UTF8,
"application/json");

            await httpClient.PostAsync(url, stringContent);
        }
//GetAsync Method
public async Task<List<Reports>> GetReportsAsync()
        {
            string url = string.Format("{0}/{1}", _apiRoot, _report);
            var httpClient = new HttpClient();

            var response = await httpClient.GetAsync(url);
            var result = await response.Content.ReadAsStringAsync();
            return JsonConvert.DeserializeObject<List<Reports>>(result);
        }
     }
```

iii. Xam.Plugin.Media

Install the NuGet: Xam.Plugin.Media [version: 3.1.1] developed by jamesmontemangno. [27] Install into client projects. And add the namespace, using Plugin.Media and sample code for image capture as shown below:

```
takePhoto.Clicked += async (sender, args) =>
{
await CrossMedia.Current.Initialize();
if (!CrossMedia.Current.IsCameraAvailable ||
!CrossMedia.Current.IsTakePhotoSupported)
            {
                await DisplayAlert("No Camera", ":( No camera
available.", "OK");
                return;
            }

            var file = await CrossMedia.Current.TakePhotoAsync(new
Plugin.Media.Abstractions.StoreCameraMediaOptions
            {
                Directory = "Sample",
                Name = "test.jpg"
            });

            if (file == null)
                return;

            //Save bytes
            using (MemoryStream ms = new MemoryStream())
            {
                (file.GetStream()).CopyTo(ms);
                contents = ms.ToArray();
            }
};
```

iv. Geolocation Detect

Install the NuGet: Xam.Plugin.Geolocator [version: 4.1.3] developed by jamesmontemagno [28]. Install into client projects. And add the namespace, using Plugin.Geolocator and using Plugin.Geolocator.Abstractions. Here the sample code to detect Geolocation as shown below:

```
try
            {
                var locator = CrossGeolocator.Current;
                locator.DesiredAccuracy = 100;

                position = await locator.GetLastKnownLocationAsync();

                if (position !== null)
                {
```

```
                    //get no position, lets check.
                    return;
                }

                if (!locator.IsGeolocationAvailable ||
!locator.IsGeolocationEnabled)
                {
                    //not available or enabled
                    return;
                }

                position = await
locator.GetPositionAsync(TimeSpan.FromSeconds(20), null, true);
            }
            catch (Exception ex)
            {
                await DisplayAlert("Location Error!", "Your Device Cann't
Access Location.\nCheck Your Location Settings.", "OK");
            }

            if (position == null)
                return;
            latitude.Text = "Latitude: " +position.Latitude.ToString();
            longitude.Text = "Longitude: "+position.Longitude.ToString();
```

Next, enable device permission to access geolocation. For UWP, got to the file named pakage.appxmanifest, and enable the internet and location. For Android, The ACCESS_COARSE_LOCATION and ACCESS_FINE_LOCATION permissions are required and are manually added to the Android Manifest when compile. For IOS, app is required to have keys in the Info.plist for detect the location like NSLocationWhenInUseUsageDescription or NSLocationAlwaysUsageDescription to access the device's location.

```
<key>NSLocationWhenInUseUsageDescription</key>
<string>This app needs access location when open.</string>
```

v. Map Configure

First, install the NuGet in the all projects. NuGet name is Xamarin.Forms.Map [version: 2.5.0.91635]. and add the namespace: using Xamarin.Forms.Maps; [30] Then need to Maps Initialization. After installing the NuGet package, some initialization code is required in each application project, after the Xamarin.Forms.Forms.Init method call.

i. For UWP – For map configuring we need to paste the code in MainPage.xaml.cs file, at the MainPage constructor.

```
Xamarin.FormsMaps.Init("INSERT_AUTHENTICATIO
N_TOKEN_HERE");
```

ii. For Android - MainActivity.cs file, in the OnCreate method.

```
Xamarin.FormsMaps.Init(this, bundle);
```

iii. For iOS - AppDelegate.cs file, in the FinishedLaunching method.

```
Xamarin.FormsMaps.Init();
```

Second Step is Platform Configuration. For iOS 8 two keys need to be added to the Info.plist file: NSLocationAlwaysUsageDescription and NSLocationWhenInUseUsageDescription. The XML representation is shown below - update the string values to reflect how application is using the location information:

```
<key>NSLocationAlwaysUsageDescription</key>
<string>Can we use your location</string>
<key>NSLocationWhenInUseUsageDescription</key>
<string>We are using your location</string>
```

For Android, to use the Google Maps API on Android must generate an API key and add it to the Android project, and needs a Google Maps API key. After following those instructions, paste the API key in the AndroidManifest.xml file:

```
<meta-data android:name="com.google.android.maps.API_KEY"
 android:value="google map api key for android" />
```

Also need to enable appropriate permissions by right-clicking on the Android project and selecting Options > Build > Android Application and ticking the following:

```
AccessCoarseLocation
AccessFineLocation
AccessLocationExtraCommands
AccessMockLocation
```

```
AccessNetworkState
AccessWifiState
Internet
```

For Universal Windows Platform, to use maps on the Windows Runtime and the Universal Windows Platform must generate an authorization token. For more information, see Request a maps authentication key on MSDN. The authentication token should then be specified in the FormsMaps.Init("AUTHORIZATION_TOKEN") method call, to authenticate the app with Bing Maps. Get the map view in the mobile application.

```
var map = new Map(
            MapSpan.FromCenterAndRadius(
                    new         Position         (37,         -122),
Distance.FromMiles(0.3)))
                {
                    IsShowingUser = true,
                    HeightRequest = 100,
                    WidthRequest = 960,
                    VerticalOptions = LayoutOptions.FillAndExpand
          };
```

4.2.1.3 Web Application

In the web application, we are using angular 2. Angular 2 web application consists of modules, where one is a bootable module that identifies the root component of our app and declares other modules, components, directive, pipes, providers, and routes that are used in this module, and there is no need to repeat these artifacts in every component. A module is a class decorated with the @NgModule() annotation, and we declare all these artifacts there. The app code will consist of the main three files:

i. app.component.ts - firstly, the one and only component of our app then we add other components when we needed.
ii. app.module.ts - The declaration of the module that will include our component.
iii. main.ts - the bootstrap of the module.

But in our developing period, we don't create the files. We follow one easy way to developing the application. For that, firstly we clone a starting project from [30] GitHub. Then we modify the app which parts are needed. Secondly, we install npm in our project. For that, open visual studio code terminal and write "npm install" following the project requirement.

Here, we discuss the first step after creating the initial angular 2 app. In our app, our first step was getting Reports data from ASP.NET Core web API. For getting JSON data, we need to create a API service for call the apiUrl. For HTTP call we use HttpClient and HttpErrorResponse. Also need to create a model for temporary store data.

Report.service.ts:

```
import {HttpClient, HttpErrorResponse} from "@angular/common/http";
import {Injectable} from "@angular/core";
import {IReport} from "./report";
import {Observable} from "rxjs/Observable";
import "rxjs/add/observable/throw";
import "rxjs/add/operator/catch";
import "rxjs/add/operator/do";
import 'rxjs/add/operator/map';

@Injectable()
export class ReportService {
  private                          _apiUrl                          =
'http://serviceappbackend.azurewebsites.net/api/';
  constructor(private _http: HttpClient) { }
   // get all reports
  getReports(): Observable<IReport[]> {
    return this._http.get<IReport[]>(this._apiUrl + "report")
      .do(data     =>     console.log('All     Reports:     '     +
JSON.stringify(data)))
      .catch(this.handleError);
  }
// all reports end
}
```

Model:

```
export interface IReport {
       id: number;
       reportSubject: string;
       reportMessage: string;
       locationId: number;
       fileId: number;
       providerId: number;
```

```
        category: number;
        reporterName: string;
        reporterPhoner: string;
        reportDate: number;
        actionStatus: number;
}
```

report-list.component.ts:

```
import {Component, OnInit} from '@angular/core';
import {IReport} from './report';
import {ReportService} from './report.service';
@Component({
  templateUrl: './reports-list.component.html',
  styleUrls: ['./reports-list.component.css']
})
export class ReportsListComponent implements OnInit {
        reports: IReport[] = [];
        constructor(private _reportService: ReportService) { }
  ngOnInit() {
    this._reportService.getReports()
      .subscribe(reports => {
        this.reports = reports;
      },
      error => this.errorMessage = <any>error);
  }
```

Report-list.component.html:

```
<div class="col-md-12">
    <div *ngFor='let report of Reports'>
        <div class="row" >
            <div class="col-md-8" >
                <a [routerLink]="['/report', report.id]">
<h3  class="text-justify">{{report.reportSubject}}</h3></a>
                <h5                                        class="text-
justify">{{report.reportMessage}}</h5>
            </div>
            <div class="col-md-4">
<img              class="img-thumbnail              img-responsive"
src="assets/images/suit_jacket.jpg"   alt="Image   for   this   iisue"
width="300" height="300">
            </div>
            <hr>
        </div>
        <hr>
    </div>
  </div>
</div>
```

Then we need to include these service and component in app.module.ts and app.componen.ts file.

App.module.ts:

```
@NgModule({
  declarations: [
       AppComponent,
       ReportsListComponent
       ],
  imports: [
       BrowserModule,
       FormsModule,
       HttpClientModule,
       bootstrap: [AppComponent]]
})
```

App.component.ts:

```
import { Component } from '@angular/core';
import { ReportService } from './reports/report.service';


@Component({
       selector: 'pm-root',
       templateUrl: 'app.component.html',
       providers: [ReportService],
})
export class AppComponent {
       pageTitle: string = 'HOTLINE SERVICE';
}
```

i. Map Configure

First, we need to set up Angular 2 Google Maps [31]. For google map, open the project and terminal and write this: npm install @agm/core –save. Then click to enter. Secondly, we follow the code and get a google map in our web page. In below we give the sample code as shown below:

```
import { BrowserModule } from '@angular/platform-browser';
import { NgModule, Component } from '@angular/core';
import { AgmCoreModule } from '@agm/core';
@Component({
  selector: 'app-root',
  styles: [`
    agm-map {
      height: 300px;
    }
```

```
          `],
          template: `
          <agm-map [latitude]="lat" [longitude]="lng"></agm-map>
          `
        })
export class AppComponent {
  lat: number = 51.678418;
  lng: number = 7.809007;
}

@NgModule({
  imports: [
    BrowserModule,
    AgmCoreModule.forRoot({
      apiKey: 'Insert here google map API Key'
    })
  ],
  declarations: [ AppComponent ],
  bootstrap: [ AppComponent ]
})
export class AppModule {}
```

Here, we need to add an extra method for string to number conversion. Because we get Lat and Lon as a string from API. And AGM map doesn't accept the string value.

```
// JSON String Convert To Number

    stringToInt(str: string) : number{
       return Number(str);
    }

    // end conversion
```

Then we bind the Lat and Lon with HTML for Angular Google Map:

```
<agm-map
[latitude]="stringToInt(location.lat)"[longitude]="stringToInt(location.lo
n)" [zoom]="18" >
<agm-marker
[latitude]="stringToInt(location.lat)"
[longitude]="stringToInt(location.lon)" ></agm-marker>
 </agm-map>
```

ii. Routing Configure

Routing helps in directing users to different pages based on the option they choose on the main page. Hence, based on the option they choose, [32] the required Angular Component will be rendered to the user. The @angular/router libraries hold

all the code necessary to implement client-side routing. we need for the base route configuration from @angular/router and some components we have already created. Then we define an array of routes which is of type Routes then use RouterModule.forRoot to export the routes.

```
import { BrowserModule } from '@angular/platform-browser';
import { NgModule } from '@angular/core';
import { FormsModule } from "@angular/forms";
import { AppComponent } from './app.component';
import { ReportsListComponent } from './reports/reports-
list.component';
import { HttpClientModule } from '@angular/common/http';
import { RouterModule } from '@angular/router';
import { Http } from '@angular/http/src/http';
@NgModule({
  declarations: [
    AppComponent,
    ReportsListComponent,
  ],
  imports: [
    BrowserModule,
    FormsModule,
    HttpClientModule,

    RouterModule.forRoot([
      { path: 'reports', component: ReportsListComponent },
      { path: '', redirectTo: 'account/signin', pathMatch: 'full' },
      { path: '**', redirectTo: 'account/signin', pathMatch: 'full'
}
    ])
  ],
  bootstrap: [AppComponent]
})
export class AppModule { }
```

Then we import the <router-outlet></router-outlet> in the main app.component.html page container. Router-outlet helps to load route templates and RouterLink to help with navigation as shown below:

```
<div>
  <nav class="navbar navbar-inverse">
    <div class="container-fluid">
        <div class="navbar-header"><a [routerLink]="['/welcome']"
class="navbar-brand">{{pageTitle}}</a>
            <button class="navbar-toggle collapsed" data-
toggle="collapse" data-target="#navcol-1"><span class="sr-
only">Toggle navigation</span><span class="icon-bar"></span><span
class="icon-bar"></span><span class="icon-bar"></span></button>
        </div>
        <div class="collapse navbar-collapse navbar-right"
id="navcol-1">
```

```
                <ul class="nav navbar-nav">
                    <li role="presentation"><a
      [routerLink]="['/home']">Home</a></li>
                    <li role="presentation"><a
      [routerLink]="['/profile']">Profile </a>
                    </li>
                    <li role="presentation"><li><a
      [routerLink]="['/reports']">All Reports</a></li>
                    <li role="presentation"><a href="#" >
                        <i class="fa fa-bell fa-lg " aria-
      hidden="true"></i>Notification</a>
                    </li>
                </ul>

                <button class="btn btn-primary navbar-btn navbar-right"
      type="button">LOGOUT </button>
            </div>
        </div>
      </nav>

      <div class="container">
        <router-outlet></router-outlet>
      </div>
</div>
```

4.2.2 Back-End or Server-Side

In server-side, we use ASP.NET Core web API. It is one the most popular and strong platform to create server-side application. ASP.NET Core can create cross platform application and build and run on windows, macOS and Linux. And main reason is it's a high-performance framework than ASP.NET. It's a play a leading position on industrial work. ASP.NET core project creates many things to by default.

4.2.2.1 Why Use Web API

we need to have an Web API because we want to store and process our data in server and let any other application (web application, Xamarin Forms mobile application) make request for post and get data from server when needed. we use of Web API is that content are stored in web server, and there is another mobile app wants to access those content. Here Web API can serve as a bridge to "connect" them. API use the HTTP Protocol, and the HTTP protocol works on request - response

method. When send a request to the web server with certain parameters through URL. In our back-end we use two HTTP method. One is GET, and another is POST.

4.2.2.2 Make A Web API With ASP.NET Core

The client is whatever consumes the web API (mobile app, browser, IoT, etc.). This example doesn't make a client. Postman or curl is used as the client to test the application. A model is an object that represents to the data in the application. For this situation, the only model is a to-do thing. Models are represented to as C# classes. The Models folder is used by convention for model classes. A controller is an object that handles HTTP requests and creates the HTTP response. This application has a single controller [33].

Prerequisites: We install the following requirement:

i. .NET Core 2.0.0 SDK.
ii. Visual Studio 2017 version 15.3.

Add a model class:

```
namespace TodoApi.Models
{
    public class TodoItem
    {
        public long Id {get; set;}
        public string Name {get; set;}
        public bool IsComplete {get; set;}
    }
}
```

Create the database context:

The database context is the primary class that coordinates Entity Framework functionality for a given data model. This class is created by getting from the Microsoft.EntityFrameworkCore.DbContext class.

```
using Microsoft.EntityFrameworkCore;
```

```
namespace TodoApi.Models
{
    public class TodoContext : DbContext
    {
        public TodoContext(DbContextOptions<TodoContext>
options)
            : base(options)
        {
        }

        public DbSet<TodoItem> TodoItems {get; set;}

    }
}
```

Register the database context:

In this step, the database context is registered with the dependency injection container. Services (such as the DB context) that are registered with the dependency injection container are accessible to the controllers. Register the DB context with the service container using the built-in support for dependency injection. Replace the contents of the Startup.cs file with the following code:

```
using Microsoft.AspNetCore.Builder;
using Microsoft.EntityFrameworkCore;
using Microsoft.Extensions.DependencyInjection;
using TodoApi.Models;

namespace TodoApi
{
public Startup(IConfiguration configuration)
        {
            Configuration = configuration;
        }

        public IConfiguration Configuration {get;}

        // This method gets called by the runtime. Use this method to add
services to the container.
        public void ConfigureServices(IServiceCollection services)
        {
            services.AddMvc();
var connection =
@"Server=(localdb)\mssqllocaldb;Database=MainDB;Trusted_Connection=True;";
services.AddDbContext< TodoContext >(options =>
options.UseSqlServer(connection));

        }
public void Configure(IApplicationBuilder app, IHostingEnvironment env)
        {
```

```
            if (env.IsDevelopment())
            {
                app.UseDeveloperExceptionPage();
            }

            app.UseMvc();
        }
}
}
```

Add Controller: Add a Web API Controller Class template. Name the class TodoController. Here is the sample code for controller.

```
using System.Collections.Generic;
using Microsoft.AspNetCore.Mvc;
using TodoApi.Models;
using System.Linq;

namespace TodoApi.Controllers
{
    [Route("api/[controller]")]
    public class TodoController : Controller
    {
        private readonly TodoContext _context;

        public TodoController(TodoContext context)
        {
            _context = context;

            if (_context.TodoItems.Count() == 0)
            {
                _context.TodoItems.Add(new TodoItem { Name =
"Item1" });
                _context.SaveChanges();
            }
        }
    }
}
```

4.2.2.2.1 HTTP GET

Web API controller can include multiple Get methods with various parameters and types. We should include following activity methods in TodoController to exhibit how Web API handles various HTTP GET requests.

Action method:

i. GetTodoById(int id) - Returns student whose id matches with the specified id.

ii. GetAllTodo (string name) - Returns list of students whose name matches with the specified name.

iii. GetAllTodoInSameStandard(int standardId) - Returns list of students who are in the specified standard.

```
[HttpGet]
public IEnumerable<TodoItem> GetAll()
{
    return _context.TodoItems.ToList();
}

[HttpGet("{id}", Name = "GetTodo")]
public IActionResult GetById(long id)
{
    var item = _context.TodoItems.FirstOrDefault(t => t.Id ==
id);
    if (item == null)
    {
        return NotFound();
    }
    return new ObjectResult(item);
}
```

4.2.2.2.2 HTTP POST

The HTTP POST request for is used to create a new record in the data source in the RESTful architecture. So how about we create an action method in our TodoController to insert new todo record in the database.

```
[HttpPost]
public IActionResult Create([FromBody] TodoItem item)
{
    if (item == null)
    {
        return BadRequest();
    }

    _context.TodoItems.Add(item);
    _context.SaveChanges();

    return CreatedAtRoute("GetTodo", new { id = item.Id },
item);
}
```

4.2.2.3 Enable CORS in Web API

By default, Browsers stay with the Same-Origin policy, which is that web cannot interact with a resource from another domain. It isolates, for example, a malicious script being able to do "too much". A script loaded from a third party should not be able to call own API.

CORS or Cross-Origin Resource Sharing is a way to by-pass this limitation/security measure for legal reasons. The most common [34] in the context of ASP.net core is that are building a Single Page Application, and we host our API on azure. For example, our website (http://www.hotlineservice.com) can't make any HTTP calls with script language like Angular 2 to our API (http://serviceappbackend.azurewebsites.net/api/report). Find a very easy solution for CORS policy to allow all requests from domain. for that-we need to install a NuGet package named- Microsoft.AspNetCore.Cors [version: 2.0.1] in web API project. Than configureServices method in startup.cs and add the CORS services:

```
public void ConfigureServices(IServiceCollection services)
{
	services.AddCors();
}
public void Configure(IApplicationBuilder app, IHostingEnvironment
env, ILoggerFactory loggerFactory)
{
	app.UseCors(options=>
		options.WithOrigins("http://www.ourwebsite.com").AllowA
	nyMethod());
	app.UseMvc();
}
```

4.2.2.4 Implementing Login Method

For login we don't implement any method in web application project. We work on API project for login. First, we define two class for Login Request and Login Response. Like:

```
        public class SignInRequest
        {
            public string Email { get; set; }

            public string Password { get; set; }
        }

        public class SignInResponse
        {
            public bool Status { get; set; }

            public string Message { get; set; }
        }
```

Then we create a controller for login request. We send a HTTP Post request through the API URL (http://serviceappbackend.azurewebsites.net/api/signin) then find the user by email and find the email then check the password and return "Valid user". If email can't find, then return "Email not found". If password not matched, then return "Password incorrect". On the other hand, SignInRequest, Email and Password is null the return "Request not valid".

```
[Route("api/[controller]")]
    public class SignInController : Controller
    {
        private readonly MainDBContext _context;

        public SignInController(MainDBContext context)
        {
            _context = context;
        }

        [HttpPost]
        public SignInResponse SignIn([FromBody] SignInRequest
signInRequest)
        {
            //Request e pass or email na thakle
            if (signInRequest is null ||
                signInRequest.Email is null ||
                signInRequest.Password is null)
                return ConstructResponse(false, "Request not valid");

            //Find the user
            var provider = _context.Providers.FirstOrDefault((p) =>
p.Email == signInRequest.Email);

            //email na paile
            if (provider is null)
                return ConstructResponse(false, "Email not found");

            //Match pass
            if (provider.Password == signInRequest.Password)
                //Valid user
                return ConstructResponse(true, "Valid user");
            else
```

```
                //pass vhul
                return ConstructResponse(false, "Password incorrect");
        }

        private static SignInResponse ConstructResponse(bool status,
string message)
        {

            //request not valid
            return new SignInResponse
            {
                Status = status,
                Message = message,
            };
        }
    }
```

4.3 Deployment

In our project requirement we need to deploy our API project on live. In developing period, we run our API project in local host. But when we start working on mobile application and run on emulator. That time emulator can't identify the local host so, we publish our API on live. Initially we can't buy any domain and hosting. We use Microsoft Azure cloud service for publishing. For use Azure Service we need subscription. Then we get a free trial subscription from azure through ULAB school account. Firstly, we create a SQL server on azure for our database (Please see screenshot in Figure 4.2).

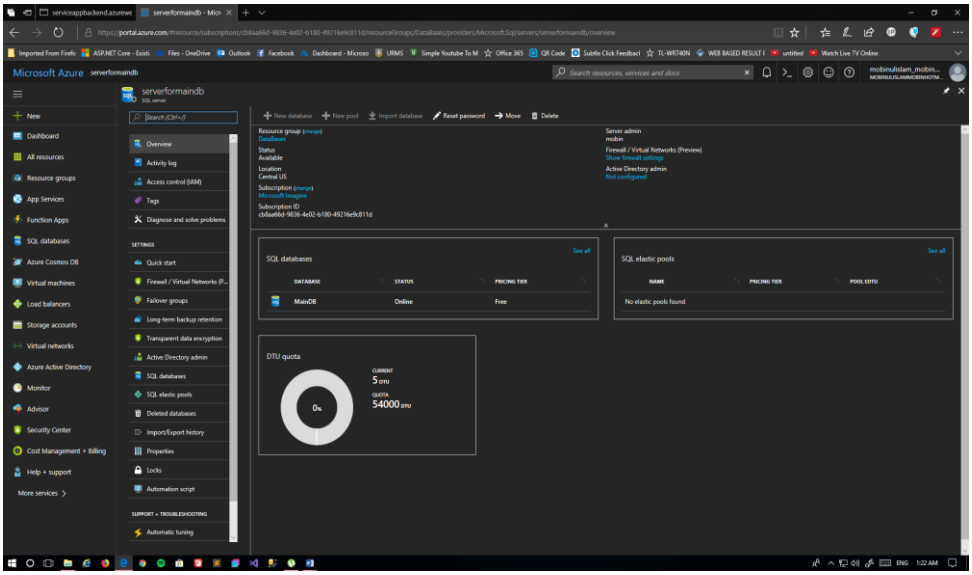


Figure 4.2: Create a SQL Server

After Create a SQL server then we need a Database. So, we create a SQL Database name MainDB in the SQL server (Please see screenshot in Figure 4.3). After that, we copy the Database connection string and paste in the project's startup.cs file with server username and password.

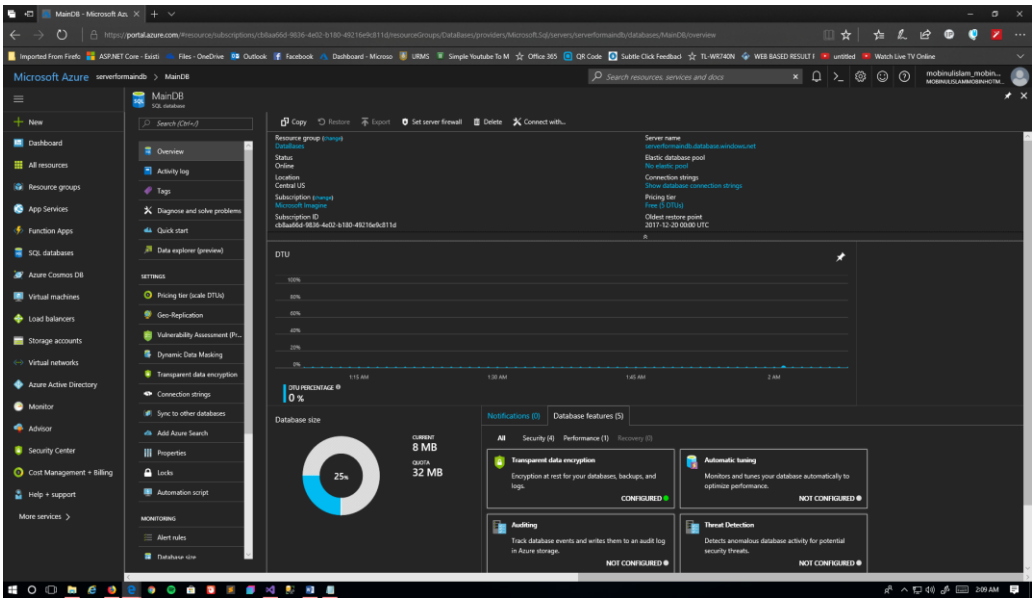


Figure 4.3: Create a SQL Database

Next, we open API project in Visual Studio 2017 and right click on the project name then click on publish (Please see screenshot in Figure 4.4).

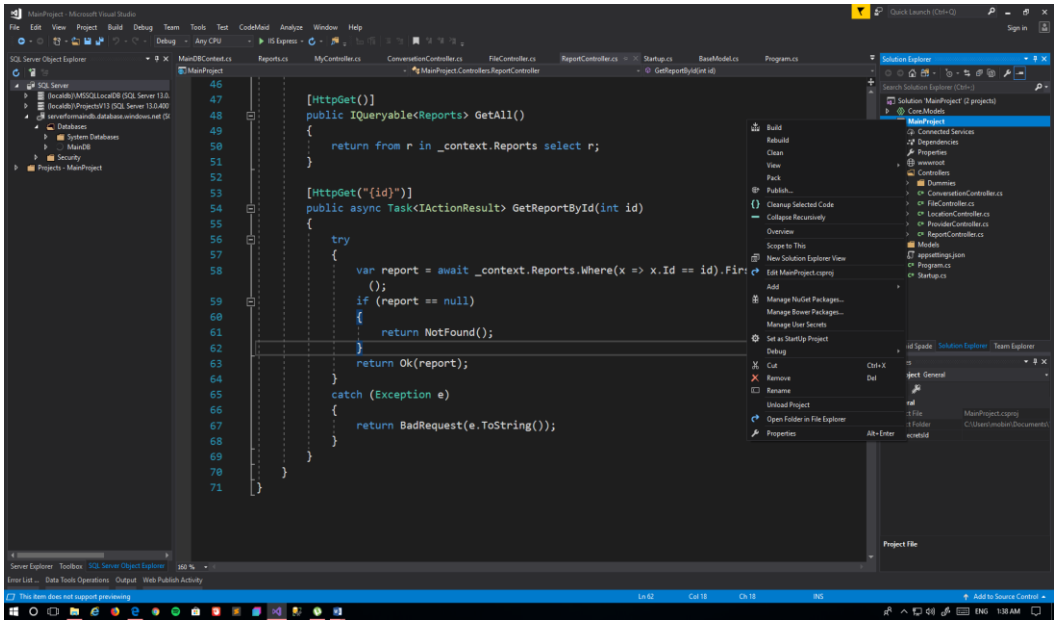


Figure 4.4: Publish the Project

When we are publishing, we need to create a App Service plan for uploading the API project (Please see screenshot in Figure 4.5).

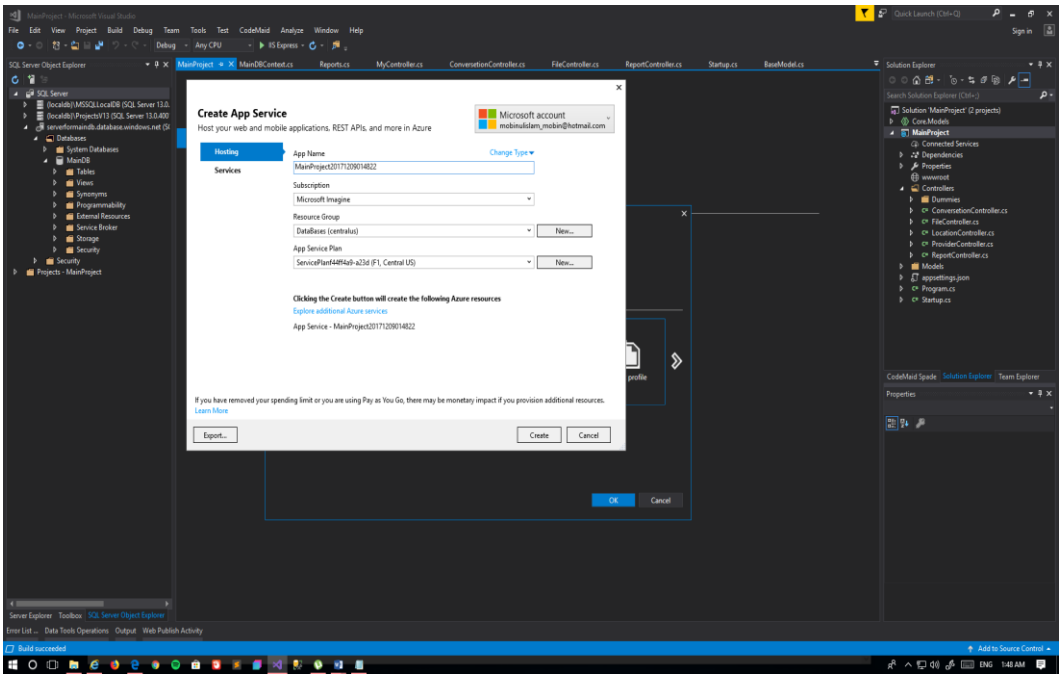


Figure 4.5: Create a App Service Plan

A window will open. Then click Microsoft Azure App service. A resource group was already created. You can create a new one then needed by clicking New (Please see screenshot in Figure 4.6).

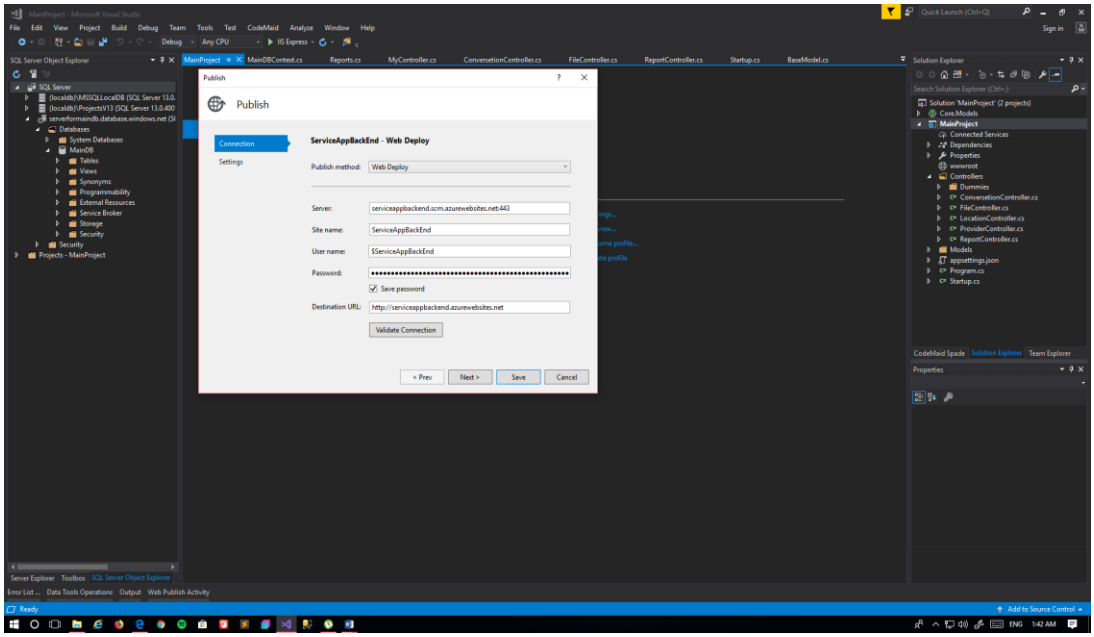


Figure 4.6: Show the Destination URL

Last screenshots we see our destination URL(http://serviceappbackend.azurewebsites.net/) in connection settings. After publishing the Back-end in azure, we entered the URL(http://serviceappbackend.azurewebsites.net/api/report) in a browser and we see our JSON data from SQL database (Please see screenshots in Figure 4.7).

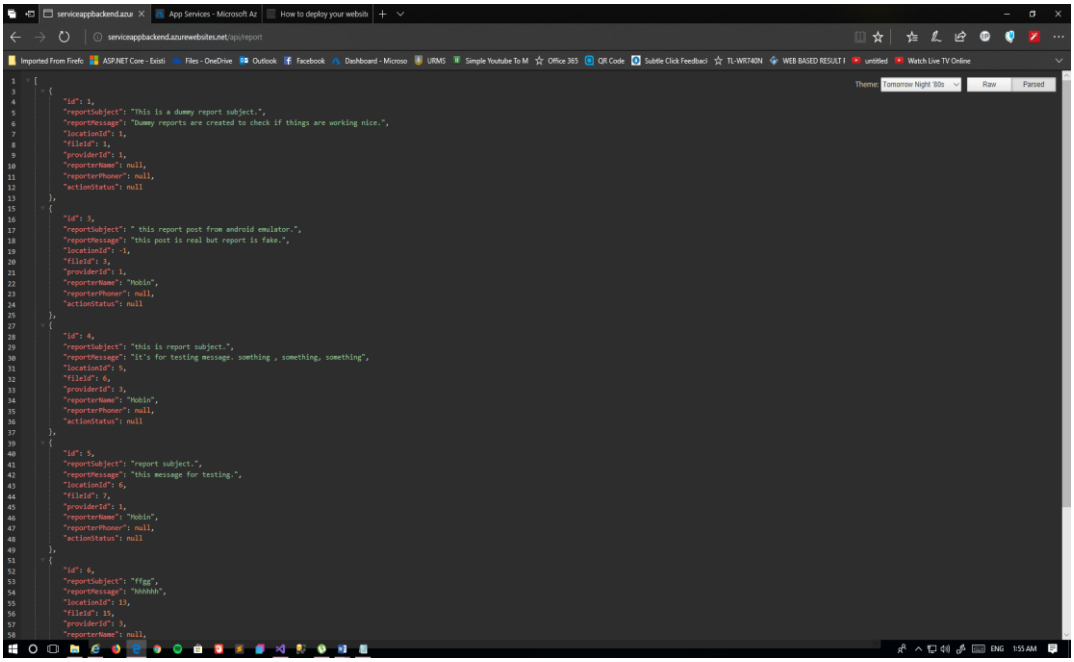


Figure 4.7: Browse the API URL

After the deployment, we use the API URL in the Xamarin Forms application. and Xamarin.Android application able to run and GET and POST all data in SQL database.

CHAPTER 5

TESTING

Testing is one of the important phases for any system development and evaluates the performance of the system. Whenever any error occurs create in the system, the system should be capable enough to handle absurd data. Testing is the process of exercising a program with the specific intent of finding errors prior to delivery to the end user. It is the next important phase after completion of the implemented phase successfully. Every software should be tested before published in market sector

Objectives of Testing: Testing is performed to evaluate whether the proposed solution is a quality product or not. The objective of testing is not to show absence of errors or defects, rather to show the presence of the errors. Some basic and important objective parts of testing are as follows:

i. To uncover different cases of potential errors and bugs.
ii. For finding out whether the system's functionalities work according to the requirement or not.
iii. To ensure that the developed system is complete and performs efficiently as specification.
iv. To evaluate whether the application can run all activities specified without crashing individual modules after integration with the current operating platform.
v. To ensure that application also performs well and can synchronize data from database.
vi. For measuring the quality, the reliability and overall performance of application.

Levels of software testing:

i. Unit Testing
ii. Functionality Testing (Quality Assurance Team)
iii. Regression Testing (Quality Assurance Team)
iv. Integration Testing
v. System Testing
vi. Acceptance Testing
vii. Load/ Performance Testing(JMeter)

5.1 Unit Testing

Unit or component testing is a leading testing part for a system [35]. Individual units are tested independently in this part. Units may be functions or objects or coherent groupings of these entities or module. This testing is a technique where testing of each unit or component in an application which is done separately. Unit testing is also recognized as module testing. It is a way of finding the defects in the module and verifies the function and non-function of our system.

5.2 Functionality Testing

Functional Testing is a kind of software testing whereby the system is tested against the functional requirements/specifications. Functional testing is a quality assurance (QA) process and a type of black-box testing that constructs its test cases on the [36] specifications of the software unit under test. Functions are tested by entered data as input and examining at the output, and internal program structure is sometimes considered. Functional testing generally describes what the system does. Functional testing does not imply that are testing a function of any module or class. Functional testing tests a small part of functionality of the full system. Functional testing is more powerful when the test conditions are made directly from user requirements. At the point when test conditions are made from the system documentation. the error in that

documentation won't be identified through testing and this might be the reason for end-users' when they at last use the system.

5.3 Regression Testing

Regression testing can be performed during any level of testing (Unit, Integration, System, or Acceptance) but it is mostly relevant during System Testing. Regression testing is a type of software testing that plans to guarantee that changes to the software [37] have not adversely affected it. Regression Testing is nothing but full or partial selection of effectively executed tests which are re-executed to guarantee existing functionalities work fine. This testing is done to ensure that new code changes should not have any error in the current functionalities. It guarantees that old code still works once the new code changes are finished. Regression Testing is required when there is a Change in requirements and code is modified by the necessity, New element is added to the software, solving the error and Performance issue.

5.4 Integration Testing

Integration testing accepts individuals the opportunity to combine all the units within a program and test them as a group. Integration Testing is performed after Unit Testing and before System Testing. The reason for integration testing is to [38] check the functional, performance, and reliability between the modules that are integrated. This testing level is designed to discover interface errors between the modules/functions. This testing is especially useful because it decides how productively the units are running together. we should more concern about how much productively every unit is running, if they aren’t properly integrated, it will affect the functionality of the software program. To run these types of tests, individuals can make use of different testing techniques.

5.5 System Testing

System Testing is a level of the software testing where a complete integrated software is tested. The process of testing an integrated system to verify that it meets specified requirements. System Testing is a black box testing technique performed to [39] evaluate the complete system. For making system testing most effective, we should more concern about many essential system and subsystems. It will have typically gone through a subsystem test and effectively verified that each subsystem fulfills its requirements at the subsystem interface test level. In Software Development Life Cycle the System Testing is perform as the first level of testing where the whole System is tested. System testing is undertaken by independent testers who haven't played a role in developing the program. This testing is performed in an environment that nearly mirrors production. System Testing enables to test, validate and verify both the Application Architecture, system and client requirements.

5.6 Acceptance Testing

In this testing part, developer should check that if the system can fulfill its all requirement or not. We also did the same work in this testing part. We tested if our mobile application can able to send report to the service providers and send any [40] reply for any report to administrator. We also tested when anyone open the reports from mobile apps and see the all information which was submitted. Like: report subject, details, image, location and replies. We also make sure that our system can save all submitted reports data. On the other hand, we also did the same testing in our web application. We also tested that administrator can sign up and log in their account and our system can save all those data and they see the all submitted reports, report information and can send and see the replies. Without acceptance test, no one can publish their application. This test is very important for developer because any type of error can happen, or some important logic can be misplaced. By completing this test, developer can publish their application successfully.

5.7 Load/Performance Testing

Load testing is a kind of Performance Testing which decides a system's execution under real-life load conditions. This testing decides how the application behaves when multiple users access it at the same time. Load testing is a subset of performance [41] testing. Performance Testing means, how fast to work in the system and Load Testing means, how much task can the system process. This testing usually identifies:

i. The maximum operating capacity of an application
ii. Decide if current infrastructure is enough to run the application
iii. Number of many users that an application can support, and adaptability to enable more users to access it.

It is a type of non-functional testing. Load testing is commonly used for the Client/Server, Web based applications - both Intranet and Internet.

CHAPTER 6

CONCLUSION

Developing a project is not only a part of completion of the bachelor degree. It is also a part of the introduction to the industrial work and learning the real scenario with mapping the theoretical knowledge. It is very interesting and a great experience for me to developing a project. After above all discussion, it is apparent that creating Web API, Mobile Application and Web Application is very interesting. Working with many new concepts add an extra value to my interest and knowledge. These three-month final project give me different set of experiences that help me for my future career. It is well-established statement that practical situations always differ from theoretical explanation. During my final project, I learn many different thing such as programming Languages, framework, tools etc. It also helps me to improve my technical skills. During this project, regularly I met my honorable Supervisor Md. Anowarul Abedin, he has more experiences in this sector and I learn lot of things from him. The main aim of creating this system is to help people and establish flexibility on government and non-government work. This website and mobile application provides them the easiest way to submit problem and get solution easily. Finally, I would like to say that, during creating this system given me novelty in my field of interest. The amount of technical knowledge I have gathered from this project is immense and I plan on pursuing it for the rest of my career.

REFERENCES

[1] Troelsen, A., 2001. C# and the. NET Platform. Apress. [Accessed 7 Oct. 2017].

[2] Vb.net-informations.com. (2017). *What is Microsoft .Net Framework*. [online] Available at: http://vb.net-informations.com/framework/what_is_net_framework.htm [Accessed 7 Oct. 2017].

[3] Docs.microsoft.com. (2017). *.NET Core Guide*. [online] Available at: https://docs.microsoft.com/en-us/dotnet/core/index [Accessed 7 Oct. 2017].

[4] Docs.microsoft.com. (2017). *Introduction to ASP.NET Core*. [online] Available at: https://docs.microsoft.com/en-us/aspnet/core/ [Accessed 8 Oct. 2017].

[5] Cholakov, N., 2008, June. On some drawbacks of the PHP platform. In Proceedings of the 9th international conference on computer systems and technologies and workshop for phd students in computing (p. 12). ACM. [Accessed 8 Oct. 2017].

[6] Shein, E., 2015. Python for beginners. Communications of the ACM, 58(3), pp.19-21. [Accessed 9 Oct. 2017].

[7] Hammershøj, A., Sapuppo, A. and Tadayoni, R., 2010, October. Challenges for mobile application development. In Intelligence in Next Generation Networks (ICIN), 2010 14th International Conference on (pp. 1-8). IEEE. [Accessed 9 Oct. 2017].

[8] Richardson, L. and Ruby, S., 2008. RESTful web services. " O'Reilly Media, Inc.". [Accessed 10 Oct. 2017].

[9] Server, S.Q.L., 2010. Microsoft SQL Server. Retrieved August 1st. [Accessed 10 Oct. 2017].

[10] Petzold, C., 2015. Creating Mobile Apps with Xamarin. Forms Preview Edition 2. Microsoft Press. [Accessed 11 Oct. 2017].

[11] Cygnet Infotech. (2017). *Comparing PhoneGap vs Titanium vs Xamarin*. [online] Available at: http://www.cygnet-infotech.com/blog/phonegap-or-titanium-or-xamarin-which-cross-platform-should-you-choose [Accessed 11 Oct. 2017].

[12] Thinkster.io. (2017). *A Better Way to Learn Angular 2 - Thinkster*. [online] Available at: https://thinkster.io/tutorials/learn-angular-2 [Accessed 13 Oct. 2017].

[13] www.tutorialspoint.com. (2017). *Angular 2 Overview*. [online] Available at: https://www.tutorialspoint.com/angular2/angular2_overview.htm [Accessed 13 Oct. 2017].

[14] C-sharpcorner.com. (2017). *Difference between AngularJS and Angular 2*. [online] Available at: http://www.c-sharpcorner.com/blogs/difference-between-angularjs-and-angular-2 [Accessed 13 Oct. 2017].

[15] Rishabh Software - An Enterprise Application Development Company. (2017). *Difference Between AngularJS and ReactJS: A Comparison Guide*. [online] Available at: https://www.rishabhsoft.com/blog/reactjs-vs-angularjs [Accessed 14 Oct. 2017].

[16] En.wikipedia.org. (2017). *Bitbucket*. [online] Available at: https://en.wikipedia.org/wiki/Bitbucket [Accessed 15 Oct. 2017].

[17] Lifehacker.com. (2017). *Cite a Website - Cite This For Me*. [online] Available at: https://lifehacker.com/how-to-use-trello-to-organize-your-entire-life-1683821040 [Accessed 15 Oct. 2017].

[18] Report, S. (2017). *999 new national help desk number*. [online] The Daily Star. Available at: http://www.thedailystar.net/country/999-new-national-help-desk-number-1284730 [Accessed 18 Oct. 2017].

[19] Anon, (2017). [online] Available at: https://voice.net.bd/ [Accessed 19 Oct. 2017].

[20] Play.google.com. (2017). *Cite a Website - Cite This For Me*. [online] Available at: https://play.google.com/store/apps/details?id=com.ntitas.bdPoliceHelpLine&hl=en [Accessed 20 Oct. 2017].

[21] Smartdraw.com. (2017). *UML Diagram - Everything You Need to Know About UML Diagrams*. [online] Available at: https://www.smartdraw.com/uml-diagram/ [Accessed 22 Oct. 2017].

[22] WhatIs.com. (2017). *What is use case diagram (UML use case diagram)? - Definition from WhatIs.com*. [online] Available at: http://whatis.techtarget.com/definition/use-case-diagram [Accessed 22 Oct. 2017].

[23] Cohn, M. (2017). *Scrum Methodology and Project Management*. [online] Mountain Goat Software. Available at: http://www.mountaingoatsoftware.com/agile/scrum [Accessed 25 Oct. 2017].

[24] Docs.microsoft.com. (2017). *What is NuGet and what does it do?*. [online] Available at: https://docs.microsoft.com/en-us/nuget/what-is-nuget [Accessed 2 Nov. 2017].

[25] Docs.microsoft.com. (2017). *Introductory Guide to Using NuGet Packages*. [online] Available at: https://docs.microsoft.com/en-us/nuget/quickstart/use-a-package [Accessed 3 Nov. 2017].

[26] Docs.microsoft.com. (2017). *Call a Web API From a .NET Client (C#)*. [online] Available at: https://docs.microsoft.com/en-us/aspnet/web-api/overview/advanced/calling-a-web-api-from-a-net-client [Accessed 5 Nov. 2017].

[27] GitHub. (2017). *jamesmontemagno/MediaPlugin*. [online] Available at: https://github.com/jamesmontemagno/MediaPlugin [Accessed 8 Nov. 2017].

[28] GitHub. (2017). *jamesmontemagno/GeolocatorPlugin*. [online] Available at: https://github.com/jamesmontemagno/GeolocatorPlugin/blob/master/docs/GettingStarted.md [Accessed 10 Nov. 2017].

[29] Developer.xamarin.com. (2017). *Map - Xamarin*. [online] Available at: https://developer.xamarin.com/guides/xamarin-forms/user-interface/map/ [Accessed 11 Nov. 2017].

[30] GitHub. (2017). *DeborahK/Angular-GettingStarted*. [online] Available at: https://github.com/DeborahK/Angular-GettingStarted [Accessed 24 Nov. 2017].

[31] Angular-maps.com. (2017). *Angular 2+ Google Maps Components*. [online] Available at: https://angular-maps.com/ [Accessed 27 Nov. 2017].

[32] Scotch. (2017). *Routing Angular 2 Single Page Apps with the Component Router*. [online] Available at: https://scotch.io/tutorials/routing-angular-2-single-page-apps-with-the-component-router [Accessed 5 Dec. 2017].

[33] Docs.microsoft.com. (2017). *Create a Web API with ASP.NET Core and Visual Studio for Windows*. [online] Available at: https://docs.microsoft.com/en-us/aspnet/core/tutorials/first-web-api [Accessed 9 Dec. 2017].

[34] WebAPI, H. (2017). *How to enable CORS in ASP.net Core WebAPI*. [online] Stackoverflow.com. Available at: https://stackoverflow.com/questions/44379560/how-to-enable-cors-in-asp-net-core-webapi [Accessed 12 Dec. 2017].

[35] Segue Technologies. (2017). *The Four Levels of Software Testing | Segue Technologies*. [online] Available at: https://www.seguetech.com/the-four-levels-of-software-testing/ [Accessed 26 Dec. 2017].

[36] Software Testing Fundamentals. (2017). *Functional Testing - Software Testing Fundamentals*. [online] Available at: http://softwaretestingfundamentals.com/functional-testing/ [Accessed 26 Dec. 2017].

[37] Leung, H.K. and White, L., 1989, October. Insights into regression testing (software testing). In Software Maintenance, 1989., Proceedings., Conference on (pp. 60-69). IEEE. [Accessed 26 Dec. 2017].

[38] Software Testing Fundamentals. (2017). *Integration Testing - Software Testing Fundamentals*. [online] Available at: http://softwaretestingfundamentals.com/integration-testing/ [Accessed 26 Dec. 2017].

[39] Segue Technologies. (2017). *The Four Levels of Software Testing | Segue Technologies*. [online] Available at: https://www.seguetech.com/the-four-levels-of-software-testing/ [Accessed 26 Dec. 2017].

[40] www.tutorialspoint.com. (2017). *Acceptance Testing*. [online] Available at: https://www.tutorialspoint.com/software_testing_dictionary/acceptance_testing.htm [Accessed 26 Dec. 2017].

[41] Guru99.com. (2017). *Cite a Website - Cite This For Me*. [online] Available at: https://www.guru99.com/load-testing-tutorial.html [Accessed 26 Dec. 2017].

[42] Sarmiento, E. (2017). *Introduction to Language Integrated Query (LINQ)*. [online] Mssqltips.com. Available at: https://www.mssqltips.com/sqlservertip/1502/introduction-to-language-integrated-query-linq/ [Accessed 10 Oct. 2017].

[43] Developer.xamarin.com. (2018). Introduction to Xamarin.iOS for Visual Studio - Xamarin. [online] Available at: https://developer.xamarin.com/guides/ios/getting_started/installation/windows/introduction_to_xamarin_ios_for_visual_studio/ [Accessed 20 Oct. 2017].