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# Attendance System - Paperless Attendance Marker

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# About this project

**Abstract** The aim of Attendance System is to remove the pen and paper approach of marking attendance in colleges and other third level institutes. The development team members believe that marking attendance using a piece of paper that is passed around the class is a very inefficient way of doing it. Students can sign their colleagues in even if they are not present in the lecture. Some lectures provide a mark at the end of the year of the module that contributes towards their final score which makes it unfair for students who show up to get the same marking as a student who doesn't show up to a lecture.

Pen and paper approach is also very distracting for the student when he/she has to sign their name on the paper when they could be paying attention to the lecturer as well as storing all the paper files of all lectures and all students is very inefficient.

With this in mind the team decided to develop an application to mark attendance using a phone. The application has two parts to it, an Android(Java) application used by lectures in class and a Web application(ASP.NET) that can be used by lecturers, parents and administrators. The Android application allows a lecturer to sign into their account in order to mark attendance by selecting radio buttons under their students name in that class which is either present, absent, sick or late and save all of the students attendance to a database(SQL) that is stored on a remote server, on the other hand the web application is used by administrators and parents. Administrators maintain everything in the database, they are responsible for adding teachers classes and students to the database, they add teachers to their respective modules, they add classes to the database and assign a teacher to it and they add students to the database and assign a parent to them. Parents on the other hand receive login credentials when they are added to the system and from there they are able to login to the application and view their child's attendance over a period of time they select as well as they can add feedback for the administrator to view whether it's feedback about a teacher, class or their child.

**Authors** This project has been developed by fourth year software development students:

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The developers created this project for our Bachelors of Science degree in Software Development. All of the work done has been divided equally among all team members as follows:

Adrian Sypos was responsible for the android application as well as certain parts of the web application such as the login and the logic behind it.

Robert Kiliszewski and Adrian Golias both worked on the web application together and split their work into pieces they both contributed to such as the edit/view classes, and the functionality of editing the details of classes, students and teachers. Each team member contributed to the web API and the database respectively.

**Acknowledgements** The team would like to use this section to thank our project supervisor Kevin O’Brein for all the help he has given us during the development of the project and for meeting us every week to keep us going and making sure that our team is doing work to the best of our abilities as well as all of GMIT’s teachers for all the help they have provided over the four years of our course.

# Chapter 1

## Introduction

For many years in all types of technical institutes across the globe it has been noticed that the process of manual attendance has been carried out for many, many years with loads of room for improvement. Not only is the process of marking attendance time consuming for both teachers and students but sometimes it may result in the false marking of attendance as well as it distracts the student from paying attention to what is happening in class when they have to write their name in, and keeping track of all the files of all students and all attendance sheets is just troublesome. Today, no college or institute has to need to maintain the pen and paper based attendance system, instead we have decided to move it to the technological way of doing daily tasks. Following this thought, our team has created an attendance monitoring system based on the concept of web services which is implemented as an Android mobile application that communicates with our web API.

The mobile application would require connecting to the database using Wi-Fi technology. Our project is an efficient, easy to use and user friendly Android mobile application for attendance monitoring. The application will be installed on the user's (in this case teacher's) smart phone. It intends to provide an interface to the teacher who will require minimal details and effort to input into the application to mark attendance of a particular class of students. Apart from that, the application would support strong user authentication, where each teacher will have their own account and quick transmission of data via the web service with minimal delay.

Lecturers will login to the phone application and get connected to the server using their credentials. After login, they will take attendance using their mobile phone without any trouble.

## 1.1 Technologies Used

Here is a list of all of the technologies used in the making of this application and a small description of what they were used in. They will later be expanded on in the Technology Review section of the paper.

- ASP.NET - Was used to develop the Web Application.
- Java - Was used to develop the Android application.
- Android - Was the platform that the phone application is launched on.
- Android - Studio Was used to write code for the android application.
- C# - Was the language for the functionality of the web application.
- Visual Studio - Was used to write code for the web application.
- SQL - Is the language used for the database.
- JSP - Was used to write the web application pages.
- WEB.API - Was used to build the Restful application.
- SMTP - Was responsible for the mail sending.
- Gradle - Was used for the building of the android application.
- GitHub - Was used as our collaboration tool to develop all of the source code for the application.

## 1.2 Objectives

Our main objective was to remove the pen and paper way of marking attendance by using a phone application that connects to our remote database and allows teacher to mark attendance for each student in a class. The main aim application is to remove any imperfections that the pen and paper approach posses as well as improve the way attendance can be tracked by generating statistics for each student.

- Teachers will be able to mark attendance via their phone and choose from four options under their students name: present, sick, late or absent.

- Parents will be able to check their students attendance in college by generating a graph for the dates they choose and they will be able to see whether their child was late, sick, present or absent respectively.
- Administrators will be responsible for maintaining the database by adding all of the teachers, students and classes and assigning everyone to where they are supposed to be.

### 1.2.1 Web application

- **1.Home Page:** This is the main page when the user opens up the application so the objective of this page is to provide useful information about the application and be easy to navigate.
- **2.Login Page:** The purpose of this page is to let the user of the web application choose their level of privileges to use through out the web application.
- **3.Contact Us:** The objective is to provide contact information for users to contact us in case of any problems encountered while using the web application.
- **4.About us:** The purpose of this page is to tell people what this application is about and who we are as the developers of it.
- **5.Add Teacher:** This is an administrator only page where the administrator will be able to add teachers to the database.
- **6.Add Class:** This is an administrator only page where the administrator will be able to add classes to the database and assign a teacher to that specific class from a drop down list where then the teacher will receive credentials to be able to login to take attendance for that class.
- **7.Add Student:** This class is also only usable by the administrator where the admin will be able to add students and assign them to a class and provide their parents email address so that the parent can receive login credentials through email.
- **8.Manage:** Here the administrator will be able to view and edit teachers, classes and students by updating their existing information in the database. The administrator will be able to choose from a drop down list what they want to view/edit.



- **9.View Feedback:** Here the administrator will be able to view the feedback that has been sent into the database by the parent of a student that is also in the database.
- **10.Reports:** Here the administrator can view reports for either the class or the student. They will be able to see how well the attendance for the class is or view an individual student report of their attendance.
- **11.Logout:** This page will log the current user out of his/her session and redirect them to the login page where they will again be able to choose whether they are an admin or a parent.
- **12.Add Feedback:** Here the parent will be able to add feedback in a text box whether they have a complaint or a compliment for the teacher/student or even report any faults that are in the system.
- **13.Student Report:** Here the parent will be able to select a date from and to a date where they wish to view their child's attendance by generating a graph that will display four statistics: Absent, sick, late or present.

### 1.2.2 Android Application

- **1.Login Page:** When the teacher boots up the application on their phone they will be presented with a login page where they will need to input the credentials that they were provided via email when the administrator added them to the database and depending on how many modules they have they will receive credentials for different types of modules they teach.
- **2.Attendance Sheet:** Once logged in, the lecturer will be presented with the list of students for the specific class they are in, each student will have their own row with radio buttons for being present, sick, absent or late which then the lecturer will be able to select one of these and at the end of the marking of class they lecture then will be able to submit the data into the database where then it can be used in other sections of the application on the web.

## 1.3 Chapters Summary

Here is a list of all the chapters that will be present in the dissertation and a brief description of what they will be about.

### **1.3.1 Introduction:**

In the introduction part of the dissertation we will give a brief introduction to what the application is supposed to do in order to interest the reader and give them a quick overview of what we have created.

### **1.3.2 Methodology:**

In this section we will discuss what development method we took in order to develop this project, talk about our research methods as well as our weekly meetings among us the developers and with our supervisor and testing of the project.

### **1.3.3 Technology Review:**

This will be the longest section of the dissertation, here we will talk about all of the different technologies that we used in order to create the project, there will be a detailed description of the technologies as well as their brief history and why we have chosen them specifically.

### **1.3.4 System Review:**

Here we will cover the system overview, diagrams, data models, diagrams and functionality of the the project.

### **1.3.5 System Evaluation:**

In this section we will talk about why our application is secure and robust through the testing methods we have used on the application we will also talk about our initial ideas vs the final product.

### **1.3.6 Conclusion:**

In this section we will talk about what went right and what went wrong in the development process. We will include any improvements we would add to the application if we were to re-develop it.

## **1.4 Project Scope**

This project was our fourth year final year project to obtain our Honours Bachelor of Science Degree so we had to set the bar high enough for it to be

acceptable and display our knowledge we have gathered over the four years of studies. Knowing the brief of the project we decided to make two application which one of them will be on the web and one of them on a phone and the two application will synchronize together to one database that is hosted remotely.

# Chapter 2

## Methodology

The following section describes the various stages of development which were undertaken throughout the development of this Attendance System. The processes and methodologies carried out in the system development life cycle will be presented and explained. Furthermore, details regarding the languages, platforms, technologies used or considered to be used alongside with the methods used to create this attendance system.

### 2.1 Agile Development - Scrum

During development of this project group took an agile approach, which is far more convenient as opposed to the more traditional approach such as water-fall. Because of extensive studies in software development methodologies and software engineering over the years in Galway-Mayo Institute of Technology the group decided to stay loyal to an agile approach called Scrum [1]. Due to its extent of flexibility, where changes can be adapted through incremental and iterative phases called Sprints the decision whether to use it or not was not difficult. Agile development plan of Scrum was the most suitable and most favorable and up to date standard of software development methodology for the purpose of this project. The purpose of building this software in the agile environment was that requirements emerged and changed as the application development life cycle was going forward. The application development sprints were split into short development life cycle (SDLC)[2] phases. Each sprint delivered satisfactory, working and tested features that were implemented in the overall project. Every iteration consisted of four distinct phases that included planning, development, review and retrospective. Generally, it is well known that the success of any software development project of any size or consequence needs both planning and estimating. Those are

critical elements of every project. However, planning and estimating are not always just about determining whether something has an appropriate deadline or schedule that will ensure flawless development life cycle without any complications. Planning was the crucial element of every single one of the sprints. In the early sprints, planning attempts to find the most suitable or appropriate solution to the overall product development question. What should be build? In order to be able to answer this question team members had to take into account all of the features that software will need to have, resources that are available to the team and most of all day to day schedules. It was impossible to answer that question all at once. Therefore, taking time to answer it iterative and incrementally until the answer was very clear was in place. A good planning process reduces both risk and uncertainty, supports far better decision making throughout development and most of all it establishes trust[3].

## 2.2 Planning

In the planning phase, group meetings were held to discuss requirements, features of the software that will be needed and how to go about implementing them. In one of the earliest meetings group decision to have meetings on weekly basis was made. Members of the group decided to schedule two days of every week to come together and brainstorm, share ideas, discuss issues and work on solutions together. Weekly supervisor meetings with Kevin O'Brien were also scheduled for every Thursday at 12.00pm. Team members would present weekly progress, which allowed for keeping the group in check and ensured that enough work was done. Supervisor meetings also provided some feedback on the progress that was made and furthermore helped with direction of future progress. Result of supervisor meetings was new weekly plan, that members of the group would discuss further during one of the scheduled meetings without supervisor. After a long discussion the group decided that the communication about the project, which was outside of the college schedules will be handled through social media. Therefore, a group on Facebook was created and strictly dedicated to conversations about the project with meeting announcements or schedules so that no member of the team was uninformed in the event of not attending one of the meetings. A big part of meetings was simply research and discussion with purpose of decision making upon certain approaches or technologies that would or would not be beneficial for the project. Brainstorming sessions were held at most of the meetings to help visualize the designs, architectures or just to simply share ideas amongst ourselves. Every group member participated equally in

discussions about changes to be made or features that needs to be improved. Planning phase included enormous amount of requirements gathering and analysis. Every piece of technology had to be reviewed and analyzed into details to help determine whether it is suitable or compatible with the current version of the software or the planned to be implemented. The result of meetings was set of tasks and milestones that were agreed upon. The achievable time frames for those tasks was also determined. Discussions resulted in clear set of tasks that individual group members took upon themselves. No task was forced upon any member of the team. Team members simply used their own initiative to take upon the task to either complete it or to challenge themselves. If the task became too difficult for any member of the team, every other member helped out in solving the problems at hand. Results of every one of the meetings was captured in the Project Board [4] on GitHub [5] and also shared within the group on social media to make sure that every team member have access to details about the meetings and always know what the plan is.

## 2.3 Development

In the development phase the group members would work on design, implementation and testing of the architecture just like determined by the planning phase. Some of the group meetings were undertaken in the spirit of working together at the same time to motivate each other or to tackle on difficulties together as they arise. Each development phase was different simply because every sprint brought new challenges and different technologies to work with to the table. Having all group members present while individually working on tasks was definitely conductive. Since development of this application was of agile approach the group members took the Scrum environment seriously. In every meeting through the development phase each member would briefly talk about the following:

- What was completed yesterday or last time that individual worked on the given task that has contributed to the team meeting the sprint goal.
- What does the individual plan on completing on that particular day to contribute to the team meeting the sprint goal.
- Does the individual see any impediment which could prevent them or the team from meeting the sprint goal and if so identify them.

## 2.4 Review

Then, in the review phase, individual team members would review the design and its functionality by demonstration of newly developed and implemented changes made to each other. The functionality of those features is tested when individual members present features to each other and later deployed when testing is done. Team members would express their thoughts on the given features by sharing it with the rest of the team. The individual tasks that were previously set in Project Board on GitHub would also be reviewed and appropriately handled depending on the feature itself. If the feature was accurate and complete the task would be marked as completed and therefore moved into completed tasks tab. If the task was not finished and needed extra work or another feature, the new task would be created and placed into Project Board for another planning phase as a result of the review. Depending on the task at hand and the difficulty or workload of the feature that was incomplete, the same member would receive the same task upon next iteration. However, if the task proves to be difficult another or perhaps all of remaining team members were assigned to the task when difficult.

## 2.5 Retrospective

Lastly, in the retrospective phase, the group meets to reflect on the iteration. Team members look back on what has been done through the iteration. Numerous discussions are held during the meeting in retrospective phase some of them being the amount of work done on the project throughout the iteration. Whether the set of features made and implemented were what the group wanted to make and if it is what the application or the system needs or if it needs any improvements. Basically whether there are improvements that need to be made regarding the project itself or the iterations, that would need immediate attention due to impact it can have on the development plan itself [6].

## 2.6 Version Control

Throughout the development of the attendance system, GitHub, a free on-line version control service was used to help with management and record keeping of all the changes to the source code. The group decided to divide the project into the following four sections: Web Application, Android Application, Database and documentation. Individual members would work on

the designated section as planning meetings determined. Individuals would work on their own or as part of the group solving issues and building software features. When the work was done it was stored locally on the individuals machine. In order for the project work to be contributed it had to be uploaded to GitHub online repository. Therefore, initially every team member would clone the online repository. Cloning would be done through command prompt which is a command line interpreter, using ‘git clone username@host:/path/to/repository’ which would copy the online content of the repository to the current local directory. The progress on the project would be saved within the local storage in the cloned project directory. And before the changes could be made to the online repository ‘git pull’ command is used to fetch and merge changes on the remote server to the local working directory. This makes sure that the latest version of the project and its content is stored locally. Then ‘git commit -m “Commit message”’ command is used to commit changes locally and prepare them for merging event with the online repository. And finally ‘git push origin master’ command is used to send or push changes to the master branch of the remote repository. The work done would then show as committed to GitHub. The group would ensure that proper version control is managed by always using pull command to get the latest version before using push command to send local changes to the remote repository. Every team member always had the most up to date vision of the software with ability to see real time changes to the repository and its source code being made. The group always kept the master branch up to date with all of the source code of finished and unfinished work, which individual team members would synchronize with every single time when working on the project. GitHub has proven helpful because the group was able to set the project scope and manage the entire project using GitHub Project Board, and issues [7]. GitHub helped the team to break down the workload into smaller and manageable segments. If there was an issue on the project that needed attention and members of the team were unable to meet, the issue was recorded and described in the GitHub issues section of the repository. Using GitHub was extremely valuable throughout the duration of the project, because team was able to visualize changes made to the project and manually check individual changes made to the online repository. In the event of completely breaking the source code to the point that the changes made were no longer to be recognized. The current version was reverted back to an older version of the application which allowed for further development without need to worry about breaking the code. There is a built-in command for GitHub that allows users to revert back to any specific commit. As long as the user has access to commit identification code and the name of the branch that the desired roll back has. This GitHub feature



has proven very helpful throughout the development of this project.

## 2.7 Testing

When decision about which frameworks should be used to validate and test the web application, the group members reached an agreement to use both Selenium[8] and Postman[9] to carry out the process. Selenium gives ability to record, edit and debug tests. The group members were familiar with Selenium IDE, since it was previously used in Software Testing module as part of Computing in Software Development course. The main reason for choosing Selenium was that the group was already familiar with using that IDE and team members had no need in learning how to work with a brand new testing software. Every web page and its features including navigation, buttons, menus, drop-down menus, delete events and content display was tested. Through the development phase of every iteration Postman was used to create simulated connections to database and allow for dummy network communication. Every dummy request was looked using trial and error approach. Developed web page content was constantly checked using postman which enabled team members to view the data packets and the content of those packets being sent. Once all of the tests have passed and packets were carrying correct data sets, team members created test suites which ran through all test cases to simulate extensive use of the web application. During brainstorming sessions through the entire life cycle of the development of this project, every team member appreciated the fact that there is no limitation to what technologies or languages can be used to develop the piece of software. The group had a choice of developing in new languages, technologies that were not part of the Computing in Software Development course, or to stick with familiar technologies, languages and frameworks that team members would feel comfortable with. For the purpose of this project, group members decided to try some new technologies and languages, while keeping loyal to Java programming language. Java was seen as dominant coding language that group members practiced in the course over the years, feeling comfortable using it and since there is always a room for better understanding of the language and improvement of individuals skills. However, Java was a familiar language for the group it was interpreted in an entirely new environment called Android Studio and Gradle which took a while to get familiar with. Every team member likes working with Java language. After all it is the most common known programming language worldwide[10]. The group decided to use java mainly because of its Object-Oriented programming which is demonstrated in the android Attendance System application

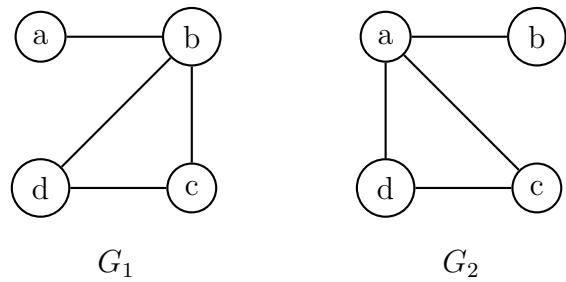


Figure 2.1: Nice pictures

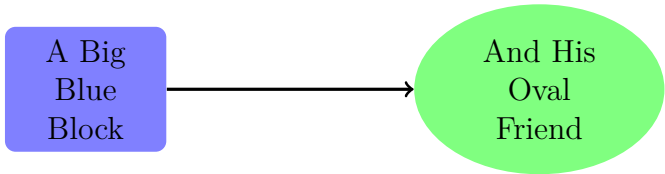


Figure 2.2: Nice pictures

for teachers. Java is highly portable because it runs on almost anything and also has satisfying support for HTML, XML and SQL all of which were used within the Attendance System architecture. Having previous knowledge of MySQL databases was very beneficial in development of attendance system database in MsSQL.

Check out the nice graphs in Figure 2.2, and the nice diagram in Figure ??.

# Chapter 3

## Technology Review

This section is dedicated towards the review of technologies used. There will be a brief description of all of the the technologies and why they are used.

### 3.1 ASP.NET

ASP.NET[11] is an open-source server-side web application framework created for web development in order to produce dynamic web pages which was created by Microsoft. By using ASP.NET programmers can create dynamic web sites, web applications and web services. It was initially release in 2002 and is constantly upgraded and improved by Microsoft.

#### 3.1.1 What is ASP.NET

ASP.NET is a cross-platform framework available to all developers across the globe for building modern, cloud-based applications connected via the internet. ASP.NET allows developers to build web applications and services as well as mobile back ends, it allows the usage of the developers favorite development tools across all operating systems as well as being able to be deployed on the cloud or on local machines.

#### 3.1.2 Why use ASP.NET

As of today millions of developers use ASP.NET to create various web applications. ASP.NET is a light-weight framework that allows developers to integrate client-side frameworks, it is cloud ready and cloud deploy able, it is much more robust than its competition. No matter what operating system the developer is using whether its Windows, macOS or Linux, ASP.NET is

runnable on each of those operating systems as well as being open source. ASP.NET is very modern, very fast and lightweight. The developer has extremely great support in the IDE and even better support when they are developing for Azure.

## 3.2 Java

Java[12] originally developed in 1995 and now owned by Oracle is an open-source general-purpose programming language that is concurrent, object oriented which was specifically to be coded once and deployed anywhere meaning that once the code is done and compiled it can be run on any machine.

### 3.2.1 What is Java

Java is a programming language that is object-oriented and is used for software development, mobile application development and large system development. It is based on the WORA principle (Write once, run anywhere) where any code that is written by the developer is ran once and is able to be run on any machine that has java installed without having to be recompiled. As of recently, Java is one of the most popular programming languages used.

### 3.2.2 Why use Java

Java being the most popular programming language in the world encourages the owners to keep it constantly updated with new versions coming out very often. As of recently, Oracle has release Java 10 which had many improvements and bug fixes from its previous versions. Java doesn't use pointers like C or C++ use which may cause unauthorized access to memory blocks when other software get the pointer values which makes it a secure programming language because Java has its own memory management mechanism. Java has incredible exception handling which captures a series of errors that allows developers to get rid of the risk of crashing a system that the java application may run on. Another secure feature of java is Byte code, each time the developer compiles their code, Java creates a class file that contains Byte code which then is tested by the JVM(Java Virtual Machine) for any viruses or files that could be threatening to the computer. Java allows for applications to be build for android which makes it ideal for this type of project.

### 3.3 Android

Android is a mobile operating system (OS) developed by Google in 2008 to be used primarily on touchscreen mobile devices such as smart phones and tablets. Additionally, Google has further developed the system to be used on other devices such as televisions, cars and watches.

#### 3.3.1 What is Android

Android is an operating system that is run on mobile phones. It is a modified version of the Linux Kernel and other open source software's.

#### 3.3.2 Why use Android

Android is the most popular operating system used in the world. It is dominant over its counter part which is the iOS with more than 60 percent users each year as well as Android being open source making it easy to develop applications for it and deploy them onto the store. Android allows any application developed to be turned into an APK(Android Package Kit) file which can be either tested using an emulator or a phone that supports android. Android is supported on many different phone brands such as Samsung, Sony, Xaomi, HTC, LG and many many more where as iOS is only supported by Apple products making it much easier to be developed for and tested as well as being the cheaper phones to buy. Android is open source making development comfortable for the developer as they can use online documentation and guides for application development whereas iOS and Apple are closed source making it tough to develop for which is why our application is developed solely for Android.

### 3.4 C#

C sharp is a multi-paradigm programming language based of C programming language developed by Microsoft in 2000. C sharp is a strong/native way of programming. It is imperative, declarative, functional, generic, object-oriented(OO) as well as component oriented. .Net is based off of C sharp.

#### 3.4.1 Why C#

C# is the language used in ASP.NET which is why our web application is mainly written in C#. ASP.NET is our main framework used in building the

we application therefore C# is the main programming language used in the development process. We have also used Visual studio to write all of the code for the ASP.NET framework which is the most compatible editor for C# which means that every addition that was needed to be used was available online.

## 3.5 SQL

SQL also known as Structured Query Language first saw light of day in 1974 and was used for storing data digitally in order to remove punch cards as a data storing system. SQL is a domain-specific language designed specifically for relational database management systems(RDBMS).

## 3.6 JSP

JSP (JavaServer Pages) is a technology released in 1999 by Sun Microsystems in order to assists developers to create dynamic web-pages based on HTML and XML as well as other document types. Similar PHP and ASP but instead it uses Java as it's base programming language.

## 3.7 WEB.API

WEB.API and extension framework to ASP.NET for building HTTP based services that are accessible on various platforms including web, mobile, windows etc.

### 3.7.1 Why WEB.API

WEB.API should be used if the .NET framework is 4.0 or above, if the developer is looking to only use HTTP protocols then WEB.API is the way to go as well as being very good with the RESTful based services which are used in this project.

## 3.8 SMTP

SMTP or Simple Mail Transfer Protocol is a TC/IP protocol for sending/receiving email's.

### 3.8.1 How does SMTP work?

SMTP is limited in the ability to queue messages in the receiving end which is why it is usually paired up with one of the other two protocols: POP3 or IMAP, which allows the receiver to save email's in the server mailbox and then download them one by one from the server. We use SMTP in order to send the users of our web application login credentials.

## 3.9 GitHub

GitHub is the number one online service for storing computer code. It allows programmers to upload their source code online for other programmers to view and use if allowed by the owner. Founded in 2008, GitHub is now the best way for developers to share code.

### 3.9.1 What is GitHub

GitHub[13] is an online services that allows developers to create accounts where they are able to then put projects, software and source code online for easy storage and not needing to store it physically. GitHub allows for code to be downloaded and uploaded with just a few simple steps which makes it user friendly. Developers can create repositories for their projects and upload their code, create goals, start issues if they need help, create projects in order to follow different parts of development as well as document everything using the Readme feature where they can specify how to run said project, what they have included, who worked on the project and list system specification for the project to be able to be run.

### 3.9.2 Why GitHub

In order to work on a project in a group, the simplest way to do so is to use GitHub. Whether there are two or twenty developers working on a project, GitHub is the place to upload code that others can then download or pull in this case and work on. GitHub allows developers to collaborate in such way that the entire project can have multiple languages and different developers yet everything can be worked on in one repository. In GitHub each progression is pushed to the repository and is called a "commit". With each commit anyone who is interested in the development part of the project, they can check what was done in each push, they can view the comments and description of the push as well as see any deletions/additions to the existing code.

### 3.9.3 How to use GitHub

There are two ways in which a developer can use GitHub: Git Bash and Git for desktop. The two work the exact same way but the only difference is that Git Bash is a cmd prompt and the desktop version is a GUI(Graphical user interface). Depending on which one the developer is comfortable using they all do the same thing: push or pull to or from the repository. At the beginning of the project a repository has to be created by one developer(even if its a group project). In the repository creation page the user chooses a name for the repository as well as whether they want to initialize it with a readme file for documentation purposes, a gitignore file for the language they are coding in to stop unnecessary files from being pushed to the repository and a license in order to make their code truly open source for other users that want to use it / change it. Once the repository is created the developer/s need to clone the directory onto their machine in order to pull all the files and initialize the folder on their desktop/laptop as a git folder in which they can then start contributing towards the project. If any changes are made to the existing repository the programmer can use these three commands: "git add ." command adds all of the new items added to the existing repository to the queue of items to be added, "git commit -m "message about what has been done""command does a commit to the repository and displays later on what code has been added/removed and finally "git push" command pushes all of the changes done in the folder that the repository is stored to the online repository where everyone then can see any changes made. When beginning any work on an existing repository and not knowing if anyone else has added any new code the programmer should use the "git pull" command in order to pull all changes from the repository, otherwise they will run into a merge problem where they are changing files without them being pulled to their local machine. GitHub for desktop which is a desktop application does the exact same actions except the person using it does not need to know the commands listed above, instead they jut need to do all of the commands by using all of the features in the desktop application.

## 3.10 Android Studio

Android studio is the official integrated development environment (IDE) built by Google for android and it was specifically made for developers to develop Android applications using this environment.



### 3.10.1 What is Android Studio

Android studio being the official Android application development kit is the best IDE for the job. It supports Gradle, it has the best layout builder for making android applications, it has built in Google cloud support and it provides an Android phone emulator if the developer does not have one themselves for testing purposes.

### 3.10.2 Gradle

Gradle is an open source building tool that has been specifically made for Android application building that uses the domain-specific language(DSL) rather than XML. It mainly focuses on Java, Groovy and Scala deployment and development but other languages are in the works to be supported. Gradle allows for multi project building which can grow to a quite large scale.

### 3.10.3 Android Studio and android development

Android studio allows for quick and simple application development for android. The way Android studio works

## 3.11 Visual Studio

Visual studio is another IDE used to develop software for computers, websites and mobile devices. Developed by Microsoft, visual studio uses platforms such as Windows API's, Windows forms, and Windows store.

### 3.11.1 Why VS

Visual studio is mainly used to develop applications in C#. Our web application is done in C# so Visual studio was our go to development environment. Visual studio has many features such as IntelliSense which is very useful for fast typing when writing code as it auto completes code by memorizing previous code writing and being able to predict what the developer is going to write as well as code refactoring which allows for changing one variable in all occurring instances in the code.

# Chapter 4

## System Design

- Architecture, UML etc. An overview of the different components of the system. Diagrams etc... Screen shots etc.

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Column 1	Column 2
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Rows 2.1	Row 2.2
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Table 4.1: A table.

# Chapter 5

## System Evaluation

- Prove that your software is robust. How? Testing etc.
- Use performance benchmarks (space and time) if algorithmic.
- Measure the outcomes / outputs of your system / software against the objectives from the Introduction.
- Highlight any limitations or opportunities in your approach or technologies used.

# Chapter 6

## Conclusion

To conclude this project, our team has developed an efficient way of marking attendance using technology. Our team feels like fixing the signing in of other students is a step forward in making students attend more lectures and get better grades since they won't be able to be signed in by their colleagues. Teachers can now mark attendance using their phones without having to print out a sheet of paper with each student's name each time they need to take attendance in a lecture and there is no longer a need to store the piece of paper in an archive for later usage since everything can be done through a database.

At the beginning of the project we set out a goal to use the finger print scanner in a phone in order to mark attendance by letting students scan their finger to create their account and to sign into the lecture they are in and also we wanted to make it so that the only way to use the application is to be connected to the college wifi. During development and during our research we have eventually concluded that it will not be possible to create an application that uses a finger print scanner to mark attendance as Android does not allow third party applications to use their finger print scanner, Android allows to authenticate the user of the phone to access an application only if they have a finger print scanner already registered but that is the only feature allowed to be used due to security reasons so that no application will ever extract the fingerprint data so that somebody else can misuse it. Due to this limitation we were forced to tweak around the project to what it is today. We had to scrape the whole idea of the finger print scanner and change it to the way it is done in other institutes in order to remove the problem of students signing their colleagues in.

Due to the changes in the development of the project we set out new goals to be reached and here is what our team has achieved:

- Two part Application/Phone and Web - We developed two applications which are synchronized in such way what data can be sent and retrieved to the same database and shared between the two applications.

## 6.1 Web Application:

The Web application has two parts: Administrator and Parent as well as the base home page which includes:

- Home: Brief introduction to the project and what inspired us to make it as well as what is implemented.
- About us: A short paragraph stating our course, year, module, supervisor and team members.
- Contact us: Page dedicated for the developer teams contact information.
- Login: Login page consists of two buttons: Admin and Parent, depending on which button you choose it will redirect you to a login page to the respective authority level where they users will only be able to use the pages for their title.

### Admin

The administrator is responsible for adding/editing all of the classes, students and teachers as well as assigning the student to the right class and the teacher respectively.

- Add Teacher: Here the admin can add the teacher to the system by providing the teachers name, mobile name, teacher email and their highest qualification.
- Add Class: Here the admin is able to add classes to the system by providing the course name, the semester and the teacher that will be assigned to the class.
- Add Student: The administrator is able to add the student to the system by providing the student's name, the class they are in, their phone number, their email, the parent name and the parent email so that they can receive the credentials for logging into their parents account.

- Manage Teacher/Student/Class: Here the administrator is able to edit details about the teacher's, classes or students as well as be able to view a list of all of the entries under each category.
- View Individual Report: Here the administrator can view an individual student's attendance report by generating a graph using the absent, sick, late or present data in the database for that student.
- View Attendance Report: Here the administrator can view a report for the whole class by also generating a graph using the data in the database.
- View Feedback: On this page the administrator can view feedback that was submitted by the parent as well as being able to delete it.

### **Parent**

The parent is able to send feedback to the administrator for viewing as well as check the students attendance in college.

- Add Feedback: Here the parent is able to add feedback inside of a text box about anything they are happy/unhappy with for the administrator to view.
- Student Report: On this page the parent can view their child's report by selecting the dates from which they want to view their students attendance. Once the date is selected a graph will be generated with the absent, late, sick or present data from the database.

## **6.2 Android Application:**

The Android Application is teacher specific, here the teacher can login using the credentials they received via email for the specific class they are in and they are able to mark attendance from there.

- Login: Here the lecturer puts in the credentials that they received via email to log into their so called "Class Account" where it will redirect them to the Mark Attendance Page where they will start marking attendance.

- Mark Attendance Page: Here the teacher is presented with a list of each student in the class and a set of radio buttons that they are to mark whether the student is sick, late, present or absent. After checking the attendance the teacher clicks clear to clear the radio buttons or submit and is presented with a box that displays the number of students and the amounts for each radio button category, if the marking is correct the lecturer then can submit the record or go back and fix anything they made a mistake on.

### 6.3 Future Development

In the future development of this application we would add new aspects and improve on the existing ones. Since this is an Attendance Marker we would make sure that you are able to remove any unnecessary information to stop recursion from happening to the database. Students come and go so do lecturers and classes also change so the option to remove unnecessary information would be beneficial to any further development of the project.

We would implement another type of account which would be for the students where students will be able to see their attendance rather than them currently not being able to see anything.

We would also implement lecturer feedback to be sent back to the parent/student where the teacher would describe their students performance in exams, their attendance etc.

Adding a reminder for students about exams in the modules they are assigned to, that would be implemented after the student would get their own account.

We could add a function to remind teachers that they have a lecture to attend to so they are never late again.

### 6.4 Problem Encountered

During the development and research parts of the project we have encountered many problems which we were able to over come. As mentioned before, we ran into the problem of not being able to progress with the previous idea for the project with a short period of time left, but we stayed calm and proceeded to work on the project as if nothing happened.

One other problem encountered was that working as a team is quiet challenging and it was tough gathering ideas since we have different ideologies.

We found it challenging to learn new technologies we never touched before in order to develop this application, Android in particular was the most challenging but as the three of us worked on it we managed to overcome that problem too as well as using Andorid studio as an IDE was quiet challenging and hard to master.

We failed to participate in every group/supervisor meeting that we had set out each week causing us to fall behind in the work flow.

As the deadline came closer and closer we were having disputes more often between each other but we managed to overcome any problems that we faced and were able to produce the full project as a team.



# Chapter 7

## Appendices

Here is the link to our github repository and screen cast where you will find all of our source code, dissertation and any files related to the project and the video showcasing the project.

- <https://github.com/Sarlianth/fingerprint-auth>
- <https://www.youtube.com/watch?v=YrmQMPoCGwI&feature=youtu.be>

### 7.1 How to run

**Web application** - The web application can be accessed in two ways: You can clone the GitHub repository and run the solution in visual studio or you can visit the page where we host the solution:

- **GitHub:** <https://github.com/Sarlianth/fingerprint-auth.git>
- **View Online at:** <http://attendancegroup13.azurewebsites.net/>

**Android** - The Android application can be accessed in two ways: By downloading the .apk file and installing it on an android phone or by cloning the repository and deploying the solution in android studio and viewing it using an emulator:

- **GitHub:** <https://github.com/Sarlianth/fingerprint-auth.git>
- **Download APK at:** <http://attendancegroup13.azurewebsites.net/>

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