**Final Year Project Template**

***Dear Students***

*This guide is prepared to help the students in preparing their final year project reports. Report writing is one of the primary professional responsibility of a practising software engineer. The final report of any project is not just a formality. It is a primary product of the engineering efforts and is often the basis for evaluation of the software engineer’s professional abilities. The report is also a service to the software community who needs the information regarding that particular software. The report should stand on its own and it should include all the necessary sections, targeting at a reader who does not necessarily have any prior knowledge about the project or the technology involved in it.*

***How to follow this guideline?***

*The sections in italics of this format report are instructions that you are supposed to follow. The other sections are meant as information that will help you to meet the minimum requirement of the report. The first portion of this report elaborates on the generic issues involved in report writing such as intellectual property, plagiarism, formatting etc.*

***Who is the Target Reader?***

*The target audience of these project reports is bachelor level CS(SE) student who only has basic knowledge of the computer science field. You should therefore assume that the reader is someone who does not know anything about your project but who may refer your work in his or her own project. Your report should therefore include all the details about the ‘what?’, ‘why?’ and ‘how?’.*

*To ensure the reports are easy to read with consistent format, it is very important that students follow the instructions while writing the report. You have taken several courses to improve your English writing skills during the BS(CS)/BS(SE) program. You are supposed to follow the elements and techniques you have learnt in those courses especially the knowledge you have gained in “Technical Report Writing” should be evident in all versions of your repors.*

***Submission Process***

*It is the reasonability of the project supervisor to make sure that the template is followed during the documentation of the different phases of the project. This is a generic document and it can be changed as per the project requirement but only with the approval of the project supervisor. You should focus on completing the artifacts provided in this guideline without worrying about the size of the report. This document must be submitted to the project coordinator on the due date with proper approval from the supervisor and co-supervisor. Failure to follow this guideline will result in the cancelation of the project. The document will be reviewed by supervisor as well as your English instructor and accepted only when its soundness satisfies both of them. Following portions of the report must be completed at each step of the projects.*

|  |  |
| --- | --- |
| ***Artefact*** | ***Completion Stage*** |
| *Chap 1 of v 1.0* | *Proposal Defense* |
| *Chap 2 , 3 of v1.0* | *Part 1 Mid Term* |
| *v 1.0* | *Part 1 Final* |
| *v 2.0* | *Part II Mid term* |
| *v 3.0* | *Part II Final* |

**Project Types**

There are two types of Final Year Project: the Development Project and the Research project.

* **Development Projects**

The objective of this type of the project is to develop a system that meets a set of user needs. This may take many forms such as a server, a program, a library, a collection of programs, an embedded system, plug-ins, modification to existing software etc.

The focus of this project is on the sound software engineering principles and functionality of the software you have produced. Your project will be evaluated in terms of how well it meets the user needs, how well is it tested and the user friendliness of the interface.

* **Research Project**

The objective of the research-oriented project is to solve a research problem. This may take the form of evaluating the effectiveness of existing solutions, modify existing solutions or developing a new solution to the problem.

The focus of this project is on the sound experimental technique, and evaluating the solution thoroughly. You will do a background research into the domain are and develop a basis of your work. The success of your solution will be evaluated on the basis of understanding and use of experimental methods as well as evaluation methodology of your solution.

*You should discuss this question with your supervisor at the proposal defence stage of the project to decide whether your project is a research oriented or a development project.*

**What is intellectual property?**

Intellectual Property is the term used to describe the outputs of creative endeavor in literary, artistic, industrial, scientific and engineering fields that can be protected under legislation. During the course of your project you may generate some novel work therefore it is necessary to understand the concept of intellectual Property.

**Plagiarism – What is it?**

1. Unauthorized act of copying/reproducing or attempt to copy an idea, writing or invention of another person
2. Extraction of academic data which are the results of research undertaken by another person, such as findings of research, data obtained, whether published or unpublished, without giving due acknowledgement to the original source.
3. Unauthorized translation of the writing of another person from one language to another whether wholly or partly.

***What must be done to avoid plagiarism?***

1. ***Citation and references.***

*Following are the main items that require citation.*

* ***Direct quotes:*** *phrases, sentences, or sections copied directly from a text; cite with quotation marks (use a limited amount of text, not a full text)*

***Example****:* “*Failure to reference appropriately will be considered unethical academic behavior and could result in allegations of misconduct*.” [1]

*The [1] symbol at the end of the quote refers to the first entry in a list of references, as shown at the end of this template under a heading ‘references’.*

* ***Paraphrased text:*** *sections of your writing that are based on research (not common knowledge) but written in your own words (not in quotes*
* ***Facts and Figures:*** *numbers, percentages, and facts that have been collected by an exclusive source (such as during an experiment or poll)*
* ***Theories, methods, and ideas****: any original idea or thought that you find during your research and present in your writing*
* ***Images, graphs, illustrations:*** *always follow copyright rules when using images, including those you find online*

*Paraphrased text, facts and figures, theories, methods and ideas, Images, graphs and illustrationsall should be referenced with symbols [ ] as shown in above example.*

*In order to have an accurate record of what you have researched and therefore an accurate reference, it is important that you write down the details of your sources as you study. You should keep a complete list of references as presented in the last section of this report template.*

1. ***Be familiar in the area that you are talking about.*** *By understanding the subject, you are more likely to write in your own words, rather than restate someone else's definition of this subject. Look for information on the topic you want to write about. This can be on the Internet or in books, although books are almost always more authoritative than the Internet.*
2. ***When in doubt, give credit.*** *Mention the source inside your paraphrase: "According to Richard Feynman, quantum electrodynamics can be described using path integral formulations."*

***Spelling***

*There is no excuse for spelling mistakes in any report as spelling errors create a bad impression. Always use a spell checker; they are invaluable for picking up typographical errors as well as genuine spelling mistakes. Note that spelling checkers cannot detect cases where the wrong word happens to be a real word e.g. from – form. So a careful proof read is necessary.*

***Writing in the third person***

*We would strongly advise to write FYP report in the third person. This provides a greater sense of objectivity and distance as the focus is on what is being said rather than who is saying it. To write in the third person, you write as if you are an outsider reporting on the aims, methods and outcomes of your project, rather than writing as though they are happening to you. First person pronouns such as "I" and "We" are replaced with third person pronouns such as "the project leader/team", "he/she, "it" and "they".*

***General Formatting Guidelines***

*Here are some general formatting guidelines that apply to the entire report:*

* *Use 1- or 1-1/2-inch margins for all four margins of the report. You might want to use a 1-1/2-inch margin at the top and 1-inch margins for the left, right, and bottom.*
* *Use a 1-1/2-inch left margin if your binding uses a lot of space*
* *Generally use double-spaced typing except in those areas where single spacing is shown (for example, in the transmittal letter, descriptive abstract, figure titles, short vertical lists, and items in the information-sources list).*
* *Use one side of the paper only.*

***Headings: Specific Format and Style***

***First-Level Headings***

*Follow these guidelines for first-level headings:*

* *Capitalize each word of first level heading except preposition and article but if they appear as the first word of heading then capitalize them as well.*
* *Use Roman OR Arabic numerals with first-levels.*
* *Either underline the words but not the Roman/Arabic numeral, OR bold the entire heading including the numeral.*
* *Make first-levels centered on the page.*
* *Start a new page whenever you have a first-level heading.*
* *Begin first-levels on the standard first text line of a page.*
* *Leave 3 blank lines between first-levels and the first line of text.*
* *Use 18-font size.*
* *Use decimal numbering system for headings.*

***Second-Level Headings***

*Follow these guidelines for second-level headings:*

* *Capitalize each word in second-levels heading.*
* *Use 16-font size and bold.*
* *Make second-levels flush left.*
* *Leave 2 blank lines between previous text and second-levels.*
* *Leave 1 blank line between second-levels and the following text.*

***Third-Level Headings***

*Follow these guidelines for third-level headings:*

* *Make third-levels sentence-style.*
* *Use bold for third-levels.*
* *Do not make third-levels a grammatical part of sentences that follow.*
* *Use the standard spacing between paragraphs for paragraphs that contain third-levels.*

***Page-Numbering Style***

* *All pages within the front and back covers are, but the page number is not always displayed.*
* *All pages coming before page 1 of the introduction use lowercase Roman numerals.*
* *All pages beginning with page 1 of the introduction use with Arabic numerals.*
* *Page numbers are not displayed on the transmittal letter, title page, and first page of the table of contents, page 1 of the introduction, and the appendix divider page.*
* *There are several choices of pagination style for the main-text pages:*
  + *Center page numbers at the bottom (halfway between the last text line and the bottom edge of the paper).*
  + *Place page numbers in the top right corner (on the right margin, halfway between the top text line and the top edge of the paper). Do not display page numbers on any page with a centered (first-level) heading (display it centered at the bottom).*
* *Some word-processing software causes problems in implementing these pagination guidelines; let your instructor know.*

***Figures and Table Labels***

* *Every figure and table must be labeled and referenced in the text. Label of the figure is placed at the bottom of the figure and list of figures must also be generated. A figure/table without their description cannot convey the intended meaning to the reader. Label of the table is placed at the top of the tables and list of tables must also be generated.*

#### AndroCom: P2P Communication Without Internet

#### Wasia BCS203233

#### Muhammad Harris BCS203193

#### Umer Ahmed BCS203182



**Fall - 2023**

**Supervised By**

**Mr. Bilal Ahmed**

**Department of Computer Science**

**Capital University of Science & Technology, Islamabad**

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| --- | --- | --- |
|  | Submission Form for Final-Year  PROJECT REPORT |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Version** | | V X.0 | |  | **NUMBER OF MEMBERS** |  |
|  | | | | | | |
| **TITLE** |  | | | | | |
|  | | | | | | |
| **SUPERVISOR NAME** | | |  | | | |

|  |  |  |
| --- | --- | --- |
| **MEMBER NAME** | **REG. NO.** | **EMAIL ADDRESS** |
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| --- | --- | --- |
| **MEMBERS’ SIGNATURES** |  | |
|  |  | **Supervisor’s Signature** |
|  |  |
|  |  |

*Note 1: This paper must be signed by your supervisor*

*Note 2: The soft-copies of your project report, source codes, schematics, and executable should be delivered in a CD*

**APPROVAL CERTIFICATE**

This project, entitled as “Menu Drive (Insert Your Project Title Here) ” has been approved for the award of

**Bachelors of Science in Computer Science**

**Committee Signatures:**

Supervisor: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(Mr. First Name Surname)

Project Coordinator: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(Mr. First Name Surname)

Head of Department: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(Dr. Abdul Basit)

**DECLARATION**

*I/We, hereby, declare that “No portion of the work referred to, in this project has been submitted in support of an application for another degree or qualification of this or any other university/institute or other institution of learning”. It is further declared thatthis undergraduate project, neither as a whole nor as a part thereof has been copied out from any sources, wherever references have been provided.*

|  |
| --- |
| **MEMBERS’ SIGNATURES** |
|  |
|  |
|  |

**ACKNOWLEDGEMENTS**

*It is usual to thank those individuals who have provided particularly useful assistance, technical or otherwise, during your project. Your supervisor will obviously be pleased to be acknowledged as he or she will have invested quite a lot of time overseeing your progress.*

**DEDICATION**

**This is an optional section**

*In this section you dedicate your project to anybody that you feel motivates you for hard work and putting effort for successful life.*

**Executive Summary**

This should be not more than one page in length (200 words approx.). The summary should allow the reader who is unfamiliar with the work to gain a swift and accurate impression of what the project is about, how it arose and what has been achieved.

*It is recommended, you write this section when the report is finished.*

**Table of Contents**

*This should give a complete list of what the report contains starting with the abstract (the title page is not included in the contents list).*

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**List of Figures**

*If the report contains figures or tables a list of these should be provided. The list should give the table or figure number, the title of the table or figure and the page number. If only a few tables and figures are present, they may be treated on one page. Remember that all figures and tables used must be referred in the text. For example “The class diagram shown in Figure 2.1 ....”*

**Figure1. 1: Work breakdown Structure**

**Figure 1.2: Sample Gant Chart**

**Figure 2.1: Sample Use case Diagram**

**Figure 2.2: System Sequence Diagram**

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**Table 2.2: Use Case 1**

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# Chapter 1 Introduction

## Project Introduction

In today's world, the internet has become such an integral part of our lives that if it were to go down tomorrow, most forms of communication, such as messaging, calls, and video communication, would cease to function. AndroCom is an Android app that enables its users to send text messages, make voice calls, and engage in video calls with complete end-to-end encryption when communicating with other users without the need of an internet connection.

AndroCom has significant market potential due to its unique features. It can work in places with no internet, help universities with daily tasks, and serve as a reliable backup during internet outages or emergencies. Its versatility and special capabilities make it valuable in various situations, making it an important tool in the market.

This functionality is implemented through an AD HOC network that is created using a microcontroller, specifically a Raspberry Pi, which serves as a critical component of the system. A server is created on the Raspberry Pi using Python, enabling packet transfer between the Raspberry Pi and the devices using AndroCom. This innovative setup ensures secure and efficient communication while bypassing the need for a traditional internet connection, addressing the challenges posed by internet interruptions or limited access scenarios.

## Existing Examples / Solutions

At present, a noticeable gap exists in the market for apps that offer communication functionality independent of an internet connection. AndroCom, by enabling text messaging, voice calls and video calls with end-to-end encryption using Raspberry Pi, distinguishes itself as an innovative solution that fills this void. Unlike conventional applications that rely on internet connectivity, AndroCom offers users a novel approach to communication in scenarios where such connectivity may be unavailable or limited, addressing a critical need in today's interconnected world.

## Business Scope

The business scope of AndroCom is promising, offering a unique solution for communication in scenarios with limited or no internet access. It caters to a niche market and educational institutions, presents a valuable tool for disaster recovery and emergency services, and has the potential to serve as a backup communication service during internet outages. With its AD HOC networking capabilities, it can find use in various temporary gathering scenarios. The app's focus on data privacy and security also appeals to users prioritizing secure communication, while its potential global reach ensures a broad user base.

## Useful Tools and Technologies

Following is a list of technologies that are used for designing, development and testing phases of the project:

* Kotlin
* Java
* Android Studio
* Figma
* Raspberry Pi
* Python

In our application development, we will employ a hybrid approach, primarily utilizing Kotlin for its modern features and conciseness, while also integrating Java where necessary for specific algorithms, socket programming and several modules. Android Studio will serve as our development environment of choice, offering a comprehensive set of tools for efficient coding and testing. Notably, our app will not rely on an internet connection due to its offline functionality. An AD HOC network is created using Raspberry Pi with a server implemented in Python.

## Project Work Breakdown

The project work breakdown for the AndroCom is given in *Figure 1.1*.

Figure 1.1: Project Work Breakdown

## Project Timeline

The project timeline for AndroCom is given in *Figure 1.2*.

Figure 1.2: Project Time Line

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# Chapter 2 Requirement Specification and Analysis

This chapter documents the specification and analysis of requirements for *AndroCom*. We have systematically sorted out the development requirements for the software, emphasizing the importance of identifying every small detail at this stage to prevent future software alterations.

This chapter covers the following specifications for the required software:

* Functional & Non-Functional Requirements
* Use Case Diagram
* Brief Description of Each Use Case
* Detailed Sequence Diagram for Each Use Case
* Domain Model
* System Architecture

## 2.1 Functional Requirements

The functional requirements for AndroCom are given in *Table 2.1*.

**Table 2.1: Functional Requirements**

|  |  |  |  |
| --- | --- | --- | --- |
| **S. No.** | **Functional Requirement** | **Type** | **Status** |
| 1 | Configure microcontroller for network connection | Core |  |
| 2 | User profile setup in application | Core |  |
| 3 | List of active users connected with the network | Core |  |
| 4 | Block or unblock users | Intermediate |  |
| 5 | Mute messages and chat notifications of users | Intermediate |  |
| 4 | Text Messages with active users | Core |  |
| 5 | Voice Calls with active users | Core |  |
| 6 | Video Calls with active users | Core |  |
| 7 | Mute mic or turn-off camera when in call | Intermediate |  |
| 8 | Multicast broadcast by creating groups | Intermediate |  |
| 9 | Media Transfer with active users | Intermediate |  |
| 10 | Network Prioritization | Intermediate |  |

## 2.2 Non-Functional Requirements

The non-functional requirements for AndroCom are given in *Table 2.2.*

**Table 2.2: Functional and Non-Functional Requirement**

|  |  |  |
| --- | --- | --- |
| **S. No.** | **Non-Functional Requirements** | **Category** |
| 1 | Prompt when connected to the wrong network | Security |
| 2 | De-authorize unauthorized users | Security |
| 3 | End-to-End text encryption | Security |
| 9 | User friendly UI | Usability |
| 10 | View last seen time in active users list | Usability |
| 11 | View Signal Strength with network | Performance |
| 12 | Reduced network latency | Performance |
| 13 | Optimize resource usage on Microcontroller | Performance |
| 14 | Low consumption and Lightweight application | Performance |

## Selected Functional Requirements

The Selected function requirements of AndroCom for FYP Part-I are given in *Table 2.3.*

**Table 2.3: Selected Functional Requirement**

|  |  |  |
| --- | --- | --- |
| **S. No.** | **Functional Requirement** | **Type** |
| 1 | Establish connection with the network | Core |
| 2 | User profile setup in application | Core |
| 3 | List of active users connected with the network | Core |
| 4 | Text messages with active users | Intermediate |
| 5 | Block or unblock users | Intermediate |
| 6 | Voice call with active users | Core |
| 7 | Mute message or call notifications of users | Core |

## System Use Case Modeling

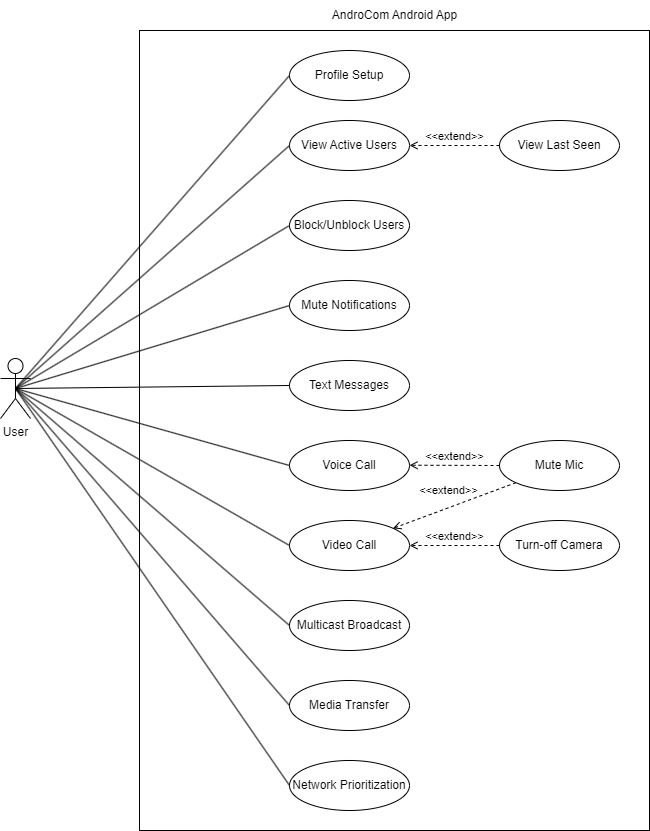
The system use case diagram of AndroCom is shown in *Figure 2.1.*

Figure .1: System Use Case Diagram

**Use Case (Establish connection with the network):**

**Table 2.1: Use Case 1**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Use Case ID:** | UC1 | | | | |
| **Use Case Name:** | Establish connection with the network. | | | | |
| **Created By:** | Wasia | | **Last Updated By:** | | Muhammad Harris |
| **Date Created:** | 22-10-2023 | | **Last Revision Date:** | | 30-10-2023 |
| **Actors:** | | User | | | |
| **Description:** | | User can establish a network connection on the Raspberry Pi device for peer-to-peer communication. | | | |
| **Trigger:** | | User initiates the application which will trigger the request to Raspberry Pi for network connection. | | | |
| **Preconditions:** | | The Raspberry Pi device is powered on with necessary software components for network connectivity and user has initiated a network connection request. | | | |
| **Post conditions:** | | The user is able to communicate with other active users on the network. | | | |
| **Normal Flow:** | | User | | System | |
| 1. The user turns on their Raspberry Pi and able to communicate with other active users. | | The systems automatically connects to the network. | |
| **Alternative Flows:** | | Raspberry Pi is not able to connect to the peer-to-peer network or the device is turned off. | | | |
| **Exceptions:** | | 1. Server is not configured to connect to the peer-to-peer network.  2.User doesn’t initiates a request and exits the application. | | | |

**Use Case (User Profile Setup):**

**Table 2.2: Use Case 2**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Use Case ID:** | UC2 | | | | |
| **Use Case Name:** | User profile setup | | | | |
| **Created By:** | Umer Ahmed | | **Last Updated By:** | | Muhammad Harris |
| **Date Created:** | 22-10-2023 | | **Last Revision Date:** | | 30-10-2023 |
| **Actors:** | | User | | | |
| **Description:** | | The user will be presented with a sign-up screen where he enters their first name, last name and optionally uploads their profile picture in app. | | | |
| **Trigger:** | | The user installs the application and wishes to complete their profile setup. | | | |
| **Preconditions:** | | The user has successfully installed the application and is on the initial sign-up screen. | | | |
| **Post conditions:** | | The user’s profile information is saved and he can access, use their profile within application. | | | |
| **Normal Flow:** | | User | | System | |
| 1.User clicks get started button to request for sign-up. | | The system provides a User initial page for profile setup. | |
|  | | 2.User provide first name, last name and clicks continue. | | The system re-direct the User to a newly created profile page. | |
| **Alternative Flows:** | | The user cancels the profile setup. | | | |
| **Exceptions:** | | 1. The User has not filled the form correctly.  2. The system is not responding. | | | |

**Use Case (List of active users connected with network):**

**Table 2.3: Use Case 3**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Use Case ID:** | UC3 | | | | |
| **Use Case Name:** | List of active users connected with network | | | | |
| **Created By:** | Muhammad Harris | | **Last Updated By:** | | Umer Ahmed |
| **Date Created:** | 22-10-2023 | | **Last Revision Date:** | | 30-10-2023 |
| **Actors:** | | User | | | |
| **Description:** | | System will provide a list of active users who are currently connected to the network for monitoring and management purposes. | | | |
| **Trigger:** | | The user selects the “Active Users” option from the application menu. | | | |
| **Preconditions:** | | User is logged into the application and a connection is established. | | | |
| **Post conditions:** | | The application displays a list of all active users connected to the network. | | | |
| **Normal Flow:** | | User | | System | |
| 1. The user selects the “Active Users” option from the application menu. | | The system displays the list of active users to the user. | |
| **Alternative Flows:** | | Network connection is not established and error message will be displayed. | | | |
| **Exceptions:** | | Network server is unavailable. | | | |

**Use Case (Text messages with active users):**

**Table 2.4: Use Case 4**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Use Case ID:** | UC4 | | | | |
| **Use Case Name:** | Text messages with active users | | | | |
| **Created By:** | Muhammad Harris | | **Last Updated By:** | | Wasia |
| **Date Created:** | 22-10-2023 | | **Last Revision Date:** | | 30-10-2023 |
| **Actors:** | | User | | | |
| **Description:** | | User can send and receive text messages to other active users on the network. | | | |
| **Trigger:** | | The user selects the chat icon from the application menu. | | | |
| **Preconditions:** | | The user must be connected to network and is logged into the application. | | | |
| **Post conditions:** | | The user is able to send and receive text messages to other active users on a network. | | | |
| **Normal Flow:** | | User | | System | |
| 1. The user selects the chat icon from application menu. | | The system displays the chat section the application. | |
|  | | 2.The user selects the recipient of a text message. | | The system highlights selected recipient. | |
|  | | 3. The user enters the text message and sends it. | | The system send text message to the recipient over network. | |
| **Alternative Flows:** | | Recipient is not active and text message is not delivered. | | | |
| **Exceptions:** | | 1. User not logged into the application  2. Network server is unavailable. | | | |

**Use Case (Block or unblock users):**

**Table 2.5: Use Case 5**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Use Case ID:** | UC5 | | | | |
| **Use Case Name:** | Block and unblock users | | | | |
| **Created By:** | Umer Ahmed | | **Last Updated By:** | | Wasia |
| **Date Created:** | 22-10-2023 | | **Last Revision Date:** | | 30-10-2023 |
| **Actors:** | | User | | | |
| **Description:** | | User can block and unblock other user within application. Blocking user will prevent further communication from or to the blocked user. | | | |
| **Trigger:** | | The user selects the “Block or unblock users” option from the application menu. | | | |
| **Preconditions:** | | User must be connected to network and is logged into the application interacting with the user whose status they want to change. | | | |
| **Post conditions:** | | The selected user is either blocked or unblocked, as per the user’s action. | | | |
| **Normal Flow:** | | User | | System | |
| 1. The user selects the “Block or unblock users” from application menu. | | The system displays a list all active users on the network. | |
|  | | 2.The user selects the user they to block or unblock of a text message. | | The system blocks or unblocks the selected user. | |
| **Alternative Flows:** | | User is already blocked or selected user is not active. | | | |
| **Exceptions:** | | 1. User not logged into the application.  2.Network connection is not established. | | | |

**Use Case (Voice call with active users):**

**Table 2.6: Use Case 6**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Use Case ID:** | UC6 | | | | |
| **Use Case Name:** | Voice call with active users | | | | |
| **Created By:** | Umer Ahmed | | **Last Updated By:** | | Muhammad Harris |
| **Date Created:** | 10-04-2024 | | **Last Revision Date:** | | 19-04-2024 |
| **Actors:** | | User | | | |
| **Description:** | | User can initiate and receive a voice call from an active user within application. | | | |
| **Trigger:** | | The user will press the call icon from the text chat section. | | | |
| **Preconditions:** | | User must be connected to network and is logged into the application. The user has selected an active user from the list and indicated to make a voice call. | | | |
| **Post conditions:** | | The user is able to a voice call with another active user on the network. | | | |
| **Normal Flow:** | | User | | System | |
| 1. The user selects the recipient of the voice call and initiates the voice call. | | The system sends a voice call request to the recipient over the network. | |
|  | | 2. The users are able to talk to each other over the voice connection. | | The system establishes a voice connection between two users. | |
| **Alternative Flows:** | | The recipient user rejects the voice call request and call is not established. | | | |
| **Exceptions:** | | 1. User not logged into the application.  2.Selected active user is no longer available or active. | | | |

**Use Case (mute messages and call notifications of users):**

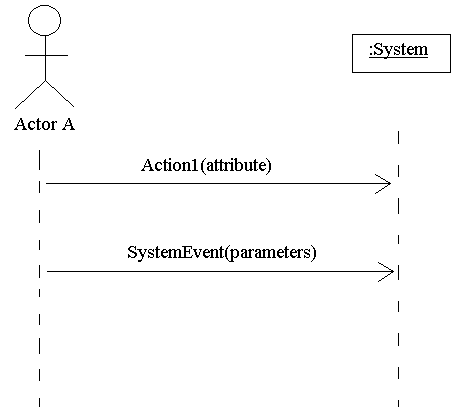
**Table 2.7: Use Case 7**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Use Case ID:** | UC7 | | | | |
| **Use Case Name:** | Mute messages and call notifications of users | | | | |
| **Created By:** | Wasia | | **Last Updated By:** | | Muhammad Harris |
| **Date Created:** | 10-04-2024 | | **Last Revision Date:** | | 19-04-2024 |
| **Actors:** | | User | | | |
| **Description:** | | User can mute messages and call notification of specific users within application. | | | |
| **Trigger:** | | The user selects the “Mute messages and call notification” option from the settings or user preferences section. | | | |
| **Preconditions:** | | User must be connected to network and is logged into the application. Also, user has identified specific users from whom they want to mute notifications. | | | |
| **Post conditions:** | | The selected user’s message and call notifications are either muted or unmuted, as per user’s action. | | | |
| **Normal Flow:** | | User | | System | |
| 1. The user selects the “Mute messages and call notifications” option. | | The system displays a list of all active users on the network. | |
|  | | 2. The user selects the users whose messages and call notifications they want to mute. | | The system mutes messages and call notifications from the selected user. | |
| **Alternative Flows:** | | The selected user is already muted or a user is not active. | | | |
| **Exceptions:** | | 1. User not logged into the application and is not connected to the network. | | | |

## System Sequence diagrams

Sequence diagrams are created to show the sequence of events among user and the system to complete an action / use case. A sample is presented in Fig 2.2.

*You are required to provide SSD of all the uses cases that you have provided above.*

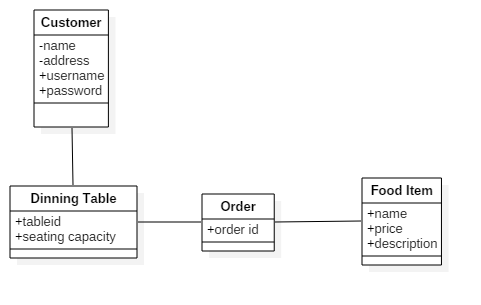


**Figure 2.2: System Sequence Diagram**

## Domain Model

Part of your initial architectural modeling efforts, particularly for a business application, will likely include the development of high-level domain model as you see in Fig. 2.3. This model should be very slim, capturing the main business entities and the relationships between them. Some people consider this type of model to be

an initial requirements model instead of an initial architecture model



**Figure 2.3: Domain Model**

# Chapter 3

# System Design

The purpose of this chapter is to provide information that is complementary to the code. Without an adequate design that delivers required function as well as quality attributes, the project will fail. But communicating architecture to its stakeholders is as important a job as creating it in the first place.

There are two views that are considered while defining software architecture. There are specific design artifacts that belong to each view. Description of such artifacts is given below. *You may select the artifacts depending on the nature of your project.*

* Structural View
  + Architecture diagram
  + Module structure diagram
  + Component diagram
  + Class diagram
* Behavioral View
  + Sequence diagram
  + Activity diagram
  + State machine diagram

At a high level, a software architecture document includes:

1. An outline description of the software design, including major software components and their interactions.
2. A common understanding of requirements, constraints and principles that influence the architecture.
3. A description of the hardware and software platforms on which the system is built and deployed.
4. Explicit justification of how the architecture satisfies the above mentioned points.

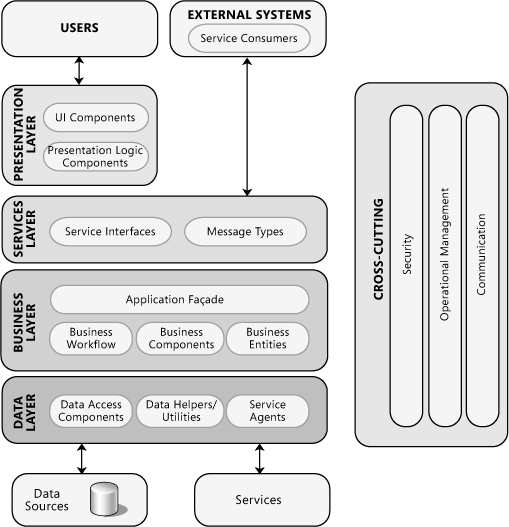
Design pattern is a description or template for how to solve a problem that can be used in many different situations. Object-oriented design patterns typically show relationships and interactions between classes or objects, without specifying the final application classes or objects that are involved.

*It is important that you justify its design, for example, by discussing the implications of constraints on your solution and different design choices, and then giving reasons for making the choices you did. At each stage of the design you should mention what kind of design patters have you followed while designing your system. You should identify which design pattern among the existing patterns are you following while designing your project.*

## Software Architecture

Software architecture is described as the organization or structure of a system, where the system represents a collection of components that accomplish a specific function or set of functions. When getting started with your design, keep in mind the key principles that will help you to create an architecture that adheres to proven principles, minimizes costs and maintenance requirements, and promotes usability and extendibility. The major decisions that you must make, and which help to ensure that you consider all of the important factors as you begin and then iteratively develop your architecture design are

* Determine the Application Type
* Determine the Deployment Strategy
* Determine the Appropriate Technologies
* Determine the Quality Attributes
* Determine the Crosscutting Concerns

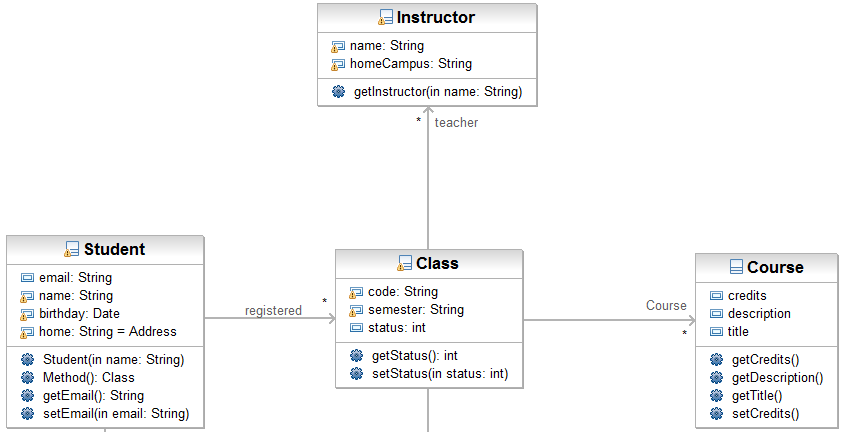


**Figure 3.1: Software Architecture Diagram**

*Fig. 3.1 illustrates common application architecture with components grouped by different areas of concern. You should think of architecture as the strategy for how you will build the system. An architectural “layer” is the top-level logical view, or an abstraction, of your design.*

## Class Diagram

Class Diagram as shown in Fig. 3.2 provides an overview of the target system by describing the objects and classes inside the system and the relationships between them. It provides a wide variety of usages; from modeling the domain-specific data structure to detailed design of the target system.

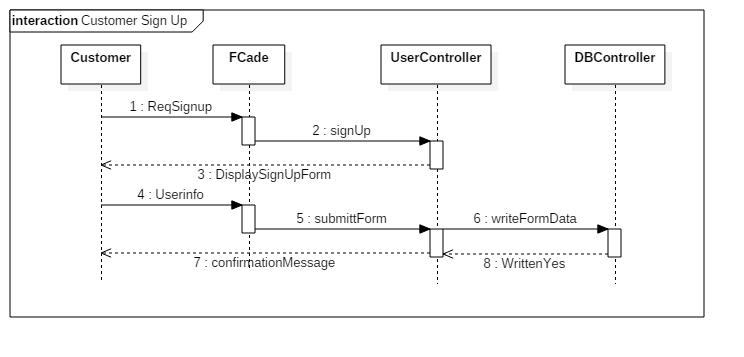


**Figure 3.2: Class Diagram**

## Sequence Diagram

Sequence diagrams, when used in conjunction with class diagrams; provide an extremely effective communication mechanism. UML sequence diagrams as shown in Fig. 3.3 are used to show how objects interact in a given situation.

*You can use a class diagram to illustrate the relationships between the classes, and the sequence diagram lets you show the messages sent among the instances of these classes and the order in which they are sent. When an object sends a message to another object, it implies that the two classes have a relationship that must be shown on a class diagram.*

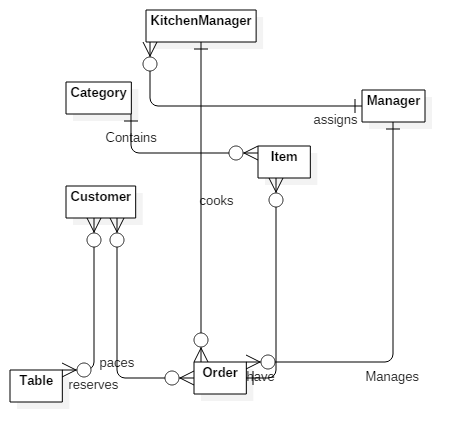


**Figure 3.3: Sequence Diagram**

## 3.4. Entity Relationship Diagram

Entity relationship model diagram (ERD) is a conceptual representation of the data in a software system. During detail design this model is mapped in to the physical database model. There are different diagramming conventions available for creating ER diagrams. A sample ERD is shown in Fig. 3.4.

**.***At this stage you may not be able to provide a comprehensive ERD therefore you may provide the refined ERD later in design chapter of the document where you will provide the fully attributed ERD such as primary keys, cardinality constraints etc.*



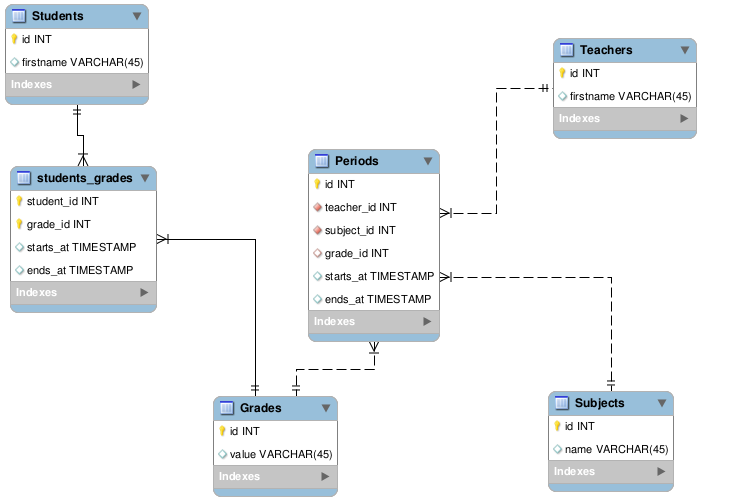
## 

**Figure 3.4: Entity Relationship Diagram**

## Database Schema

A database schema represents the logical configuration of all or part of a relational database. It can exist both as a visual representation and as a set of rules known as integrity constraints that govern a database. These rules are expressed in a data definition language, such as SQL. A database schema indicates how the entities that make up the database relate to one another, including tables, views, stored procedures, and more. A database scheme includes information related to primary and secondary keys, normalization and indexing.

You may present database scheme using front end tool of any DBMS or any other design tools such as Visio or Enterprise Architecture. A sample database scheme is shown in Fig. 3.5.

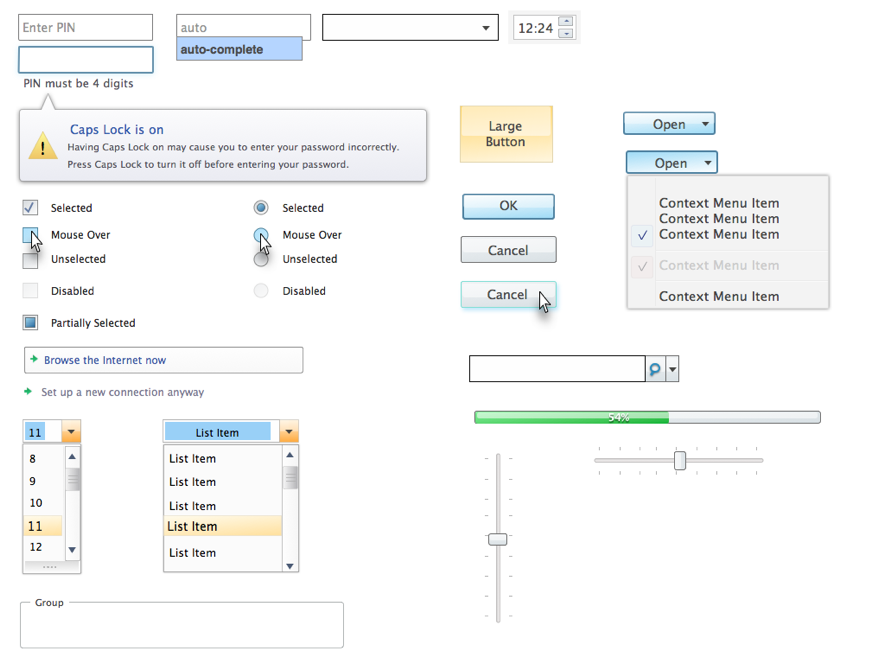
.

**Figure 3.5: Database Schema**

## User Interface Design

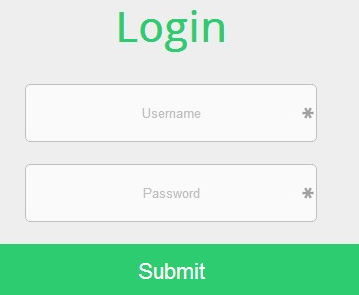
User Interface (UI) Design focuses on anticipating what users might need to do and ensuring that the interface has elements that are easy to access, understand, and use to facilitate those actions. UI brings together concepts from interaction design, visual design, and information architecture.

*You should describe the UI design in such a way that it remains simple and consistent along different views. Common GUI elements are shown in the Fig. 3.6. You should describe the UI design of each page.*



**Figure 3.6: Common GUI elements**

*Example Login Page as shown in Fig. 3.7 will contain one text field and one password field. Max length of text field is 8 and min is 4 whereas maximum length off password is 6 and minimum is 3.*



**Figure 3.7: Example Login Page UI Design with description in text**

## Software COTS

If you use COTS (Components Off the Shelf, also named SOUP, Software Of Unknown Provenance), list them here.

For each COTS, describe:

* Its identification and version
* Its purpose
* Where it comes from: manufacturer, vendor, university …
* Whether it is maintained by a third party or not
* If this is an executable,
  + What are the hardware / software resources it uses
  + Whether it is insulated in the architecture and why

# Chapter 4

# Software Development

The Implementation section is similar to the Specification and Design section in that it describes the system, but it does so at a finer level of detail, down to the code level. This section is about the realization of the concepts and ideas developed earlier. It can also describe any problems that may have arisen during implementation and how you dealt with them.

**Make sure that the system design corresponds to the implementation of the project. If there is no relationship between design and implementation, it may downgrade your score in FYP.**

You should also mention any unforeseen problems you encountered when implementing the system and how and to what extent you overcame them. Common problems are:

* Difficulties involving existing software, because of e.g.,
  + Its complexity,
  + Lack of documentation;
* Lack of suitable supporting software
* Overambitious project aims.

A seemingly disproportionate amount of project time can be taken up in dealing with such problems. The Implementation section gives you the opportunity to show where that most of the effort has been spent.

## Coding Standards

*Describe the indention, declaration,naming convention and statement standard used while coding the project.*

## Development Environment

In this section you will provide the reason behind using all the existing tools and technologies that you may have used during the development of your project. This includes development environment that you have used. How have you deployed the development environment? What different kind of packages you have used? Are there any third party libraries involved etc?

## Software Description

In this section you will identify major modules of the software that you have produced. You will show the class diagram of these major modules for this section. Typical subheadings of this section can be

**Login process**

**Loading Data**

**Data processing**

**Report generation**

**…..**

Moreover you will also discuss the logic that you have implemented in the code of those modules with the help of code snippets as shown below in the examples. Do not attempt to describe all the code in the system, and do not include large pieces of code in this section.

* Are especially critical to the operation of the system.
* You feel might be of particular interest to the reader for some reason
* Illustrate a nonstandard or innovative way of implementing an algorithm, data structure, etc.

**Snippet 1**

#define SWAP(type, x, y) \

do { \

type temp;

temp = x;

x = y;

y = temp; \

} while(1)

**Description**: This function takes 2 arguments. Then we have an infinite loop that swaps the value of the two passed variables.

You are not allowed to include the complete source code of the software how ever you can include important functions of your major modules to discuss the logic of your code.

**Snippet 2**

#define pop(type, Top) \

type temp;

temp = Top.item;

Top = Top.next;

return temp;

**Description**: This function pops the top of the stack. It places the top pointer to the next item of the stack and return the popped item..

You are not allowed to include the complete source code of the software how ever you can include important functions of your major modules to discuss the logic of your code.

# Chapter 5

# Software Testing

Software Testing is the most crucial part of Software Development Process. It is the investigation or evaluation of a software component, improving them, and finding bugs and defects. Testing is usually done by executing a system in such a way that it identifies any gaps, errors, or missing requirements in contrary to the actual requirements.

## 5.1. Testing Methodology

It is essential to have a testing plan in place to ensure that the product delivered is robust and stable, and is delivered on a predictable timeline.

*In this section you will discuss the reason of various testing techniques that you have used to test the software you have created such as integration testing, component testing and system testing etc.*

## 5.2. Testing Environment

*Describe and discuss the reason to use the selected testing environment.*

## 5.3. Test Cases

*You should describe how you demonstrated that the system works as intended (or not, as the case may be). Include comprehensible summaries of the results of all critical tests that were carried out. You might not have had the time to carry out any full rigorous tests you may not even got as far as producing a testable system. However, you should try to indicate how confident you are about whatever you have produced, and also suggest what tests would be required to gain further confidence*

* **Test Case 1**
* Test case description
* How test case was generated
* Expected result of the test case
* Actual result of the test case

**Table 5.1: Test Case 1**

|  |  |
| --- | --- |
| Date: 06 June 2017 |  |
| *System:* Menu Drive |  |
| *Objective:* View location of delivery boy | *Test ID:*1 |
| *Version:*1 | *Test Type:* Unit testing |
| *Input:*  Longitude=33.7294  Latitude=73.0931 | |
| *Expected Result:*return Islamabad location. | |
| *Actual Result:* passed | |

### 

Chapter 6

**Software Deployment**

## 6.1. Installation / Deployment Process Description

*In this section you have to provide step-by-step guide for the installation of the software produced with the help of screen shots.*

# Chapter 7

# Project Evaluation

This chapter includes the examiners evaluation report, including the points to be revised/included along with the selected requirements in the next iteration.

## 7.1. Project Evaluation Report

* References

All the documents, papers, articles and WebPages that you have taken help from must be cited in the references section

## Book

Author(s), Book *Title*. Place of publication: Publisher, year, volume, page number(s).

Example: [1] W.K. Chen, *Linear Networks and Systems*. Belmont, CA: Wadsworth, 1993, pp. 123-35.

**Webpage**

Author(s) and/or organization, date of publish or date the page was last updated, title of web page document, website address that provides a direct link to the document, and the date you last accessed the document

Example: Winston, J 1999, *A look at referencing,* AAA Educational Services, accessed 20 October 2015, <http://www.aaa.edu.au/aaa.html>. United Nations Web Services 2006,

**Research Paper**

*Author(s), "Article title,* Journal Title*, vol., no., page number(s), Month year.*

Example: [2] G. Pevere, "Infrared Nation, *International Journal of Infrared Design*, vol. 33, pp. 56-99, Jan. 1979.

*If you need to reference any item that is not the the list, you should consult IEEE citation format available at the following link* [*http://library.queensu.ca/book/export/html/5846*](http://library.queensu.ca/book/export/html/5846)

**Appendix**

**User Manual of the software**