**COMSATS University Islamabad (CUI)**

# Software Requirement Specification
# (SRS DOCUMENT)

## for

## Weather Disaster and Early Warning Application

Version 1.0

### By
**Faizan Sharif**
**CIIT/FA21-BSE-007/VHR**
**Salman Sharif CIIT/FA21-BSE-056/VHR**

### Supervisor
**Kalim Sattar**

## Bachelor of Science in Computer Science
## (2021-2025)

# Revision History

| Name | Date | Reason for Changes | Version |
|------|------|--------------------|---------|
|      |      |                    |         |
|      |      |                    |         |
|      |      |                    |         |
|      |      |                    |         |
|      |      |                    |         |
|      |      |                    |         |

## Application Evaluation History

| Comments (by committee) *include the ones given at scope time both in doc and presentation | Action Taken |
|---|---|
| | |
| | |
| | |
| | |
| | |

**Supervised By**

**Kalim Sattar**

**Signature**

# Abstract

The Weather Disaster and Early Warning Application enables users to get current weather information for cyclones, tornadoes, heavy rains, and floods amongst others. It targets the risky regions providing reliable information and prediction for the purpose of improving the disaster response. Developed with Flutter and Python, the app provides personalised alerts, storm chasing, and floods notice using factual information from CMA and OpenWeatherMap. The purpose is to assist the users in initiating appropriate action and minimize the hazards resulting from such climate changes.

# TABLE OF CONTENTS

## LIST OF FIGURES

**LIST OF TABLES**

# Chapter 1

## Introduction

### 1.1 Project Scope

The **Weather Disaster and Early Warning Application** is designed to address the provision of alerts and forecasts of hazardous weather events, namely cyclones, tornadoes, heavy rain, and floods. The application will be useful to users in high-risk zones, enabling them to receive up-to-date information.

Key components of the project scope include:

- Cyclone tracking in real-time, with high and accurate forecasts of storm surges or identification of areas prone to red zone effects.

- Precipitation alerts, including floods and heavy rain, with real-time precipitation information.

- Selective, place-specific notifications for various types of weather conditions.

- An easy-to-navigate UI for mobile.

Some existing integrations with other sources include CMA and OpenWeatherMap.

## 1.2   Project Significance

The role of the **Weather Disaster and Early Warning Application** is crucial in supplementing safety and disaster preparations in areas prone to climate disasters such as cyclones, excessive rains, and floods. Its significance lies in:

1. **Improved Early Warning System:** With real-time, location-based alerts, the application gives users ample time to prevent the occurrence of disasters, thereby reducing deaths and losses.

2. **Filling a Market Gap:** Most current weather applications lack specificity and accuracy in providing information about extreme weather conditions. This application fills that gap by offering specialized alerts and forecasts for life-threatening scenarios.

3. **Risk Reduction:** With timely, accurate, geolocation-based tracking and early alerts, users can make informed decisions, such as leaving the affected area or preparing for floods, thus reducing the impact of natural disasters.

4. **Public Safety Enhancement:** It aids individuals, communities, and emergency response teams in preparing before, during, and after severe weather, thus enhancing overall public safety and disaster preparedness.

5. **Customizable Alerts:** The location-based notification system increases relevance for users, ensuring they receive time-sensitive information to take necessary action when hazardous weather is present.

## 1.3   Target Audience

The **Weather Disaster and Early Warning Application** is designed for:

1. **Residents in High-Risk Areas:** Individuals residing in cyclone-prone, tornado, torrential rain, and flood zones.

2. **Emergency Responders:** Individuals dependent on timely alarms or sirens, including local authorities, disaster management, and first responders.

3. **Travelers and Tourists:** People traveling to regions where there are high risks, allowing them to seek safety when the weather is unfavorable.

4. **Government and Municipal Agencies:** Institutions that require weather predictions for safety precautions, especially agencies involved in disaster management.

5. **Businesses in Affected Regions:** Enterprises that plan for search and rescue operations or have facilities in vulnerable areas, requiring continuity despite severe weather conditions.

## 1.4    Project Timeline

The development of the **Weather Disaster and Early Warning Application** is expected to follow these phases:

1. **Phase 1: Requirements Collection (Weeks 1 & 2)**

   - Finalizing functional and non-functional specifications.

   - Defining stakeholders and data suppliers (e.g., CMA).

2. **Phase 2: Design and Planning (3 weeks)**

   - Developing system architecture and designing the user interface (UI/UX) for both mobile and web applications.

   - Planning API integration and data processing.

3. **Phase 3: Development (8 weeks)**

   - **Frontend Development (Flutter):** Developing interfaces using UI controls across platforms.

   - **Backend Development (Python):** Processing weather data and issuing alerts.

4. **Phase 4: Integration & Testing (4 weeks)**

   - Incorporating APIs to fetch real-time weather data.

   - Conducting unit tests, integration tests, and user acceptance testing (UAT).

5. **Phase 5: Deployment and Launch (2 weeks)**

   - Hosting the application on mobile operating systems (iOS/Android) and web platforms.

   - Monitoring the initial use and addressing post-launch issues.

6. **Phase 6: Maintenance & Updates (Ongoing)**

   - Frequent updates including bug fixes, performance improvements, and feature enhancements.

**Total Project Duration: 19 weeks.**

# Chapter 2

## Description

The Weather Disaster and Early Warning Application for Android is a complete application packed with alerts and real time information to inform the users of cyclones, tornadoes, heavy rainfall and floods. It features current and proximal notification that will enable users to act appropriately and decrease probabilities of perishing in cases of natural disasters. The application is created with Flutter, which guarantees a fast and stable run of the app on every Android device.

**Key Features:**

1. **Cyclone Tracking and Alerts:**
   - The app offers cyclone positioning; the location of the storm, cyclone trajectory, and the strength of

the cyclone in the course of the subsequent one day period.

- It will provide users real time alerts of storm surge risks and Red zone when they are in the path of a dangerous cyclone.

2. **Heavy Rain and Flood Warnings:**

- The app predicts an occurrence of a heavy rainfall event and alerts the users of flooding in their locations.

- Correct rainfall data assists the users to mitigate or avoid water related disasters like floods from flash floods or river bursts.

3. **Customizable Notifications:**

- It allows its users to personalize the kind of alert that is depending on the event severity and the users location. Thus, only those messages that require the attention of a particular user will be transmitted.

- People can turn alerts on for weather events such as cyclones or floods, according to the usage of every individual.

4. **Real-Time Notifications:**

- The system delivers an alert to the user through an instant push notification the moment a likelihood

of adverse weather condition is realized close to the user.

- Notifications are meant to be brief but informative and give the notification recipient sufficient information on the event in question and sensible safety instructions.

5. **User-Friendly Interface:**

   - Various conveniences include an easy to use and easy to navigate Android application where users can view weather information at a glance as well as see warnings and follow storms via maps.

   - Users can choose a specific state or allow GPS to set up notifications for notifying them in real time for the regions they are currently in.

**How it Works:**

- **Data Integration:** The maps also get real weather data from authenticated sources like CMA & Open Weather Map to offer accurate data.

- **Interactive Maps:** The app provides updated real time tracking on storm, precipitation and areas affected by floods, and even weather map pictures so that the users can easily have the picture of the weather in their area.

- **Custom Alerts:** Users can select specific regions or use their current GPS location to receive customized alerts about weather events that affect them directly.

- **Safety Recommendations:** Furthermore, the app provides specific safety tips and measures that the user has to take when threatened by serious weather conditions.

**Technical Details:**

- **Built with Flutter:** Flutter was used to the development of the app so it feels fast and as if it's native especially to the android devices in addition to this the app is easy to update and maintain since all the platforms share the same code.

- **Backend Processing:** This is a Python application backend, used for data collection and weather predictions, making sure that the forecast is on time using Artificial Intelligence.

- **Google Play Store Distribution:** This app will be stored at the Google Play Store which makes it easy for Android users to access, update and manage the application.

# Chapter 3

## Requirement Collection Techniques

Thus, it is possible to use different requirement collection techniques to obtain precise and inclusive data on the requirements for the **Weather Disaster and Early Warning Application**. All the techniques can actually assist in the confirmation of the alignment of the system to the user needs, the technical requirements and the business requirements. Here are the most effective techniques:

### Interviews

- **Stakeholder Interviews:**Face-to-face/moderated focus groups with key stakeholders including the disaster management agencies Met office and the target users.

- **Key Questions:** Which kind of severe weather do you prefer the app to concentrate on? That triggers these

questions: What are the most essential facets of alerting and forecasting for the users?

The following are surveys and questionnaires:

- **Target Audience Surveys:**Survey inhabitants of the extreme-risk zones, regarding their past experiences in extreme weather conditions and their measures on the preparation to such events.

- **Benefits:** Gather significant amount of data about target audience about what features they want to see in application, their preferred alert style, and interfaces.

## Workshops and Focus Groups

- **Collaborative Sessions:** This includes inviting emergency responders, weather experts, and community members to conduct focus group sessions where they group generate ideas and features necessary during natural disasters and identify the typical obstacles the encountered during such calamities.

- **Focus Groups:** Involve selected target user to discuss about the experience of the users in the app's notifications as well the right time of alert and information required.

## Use Case Development

- **Scenario-Based Discussions:** Create detailed use cases to capture how users will interact with the system in different scenarios, such as during a cyclone, flood, or tornado.

- **Benefits:** Identifies functional requirements by outlining step-by-step actions users will take during critical weather events.

There are common exercise including brainstorming sessions that are often adopted in the organization.

- **Collaborative Idea Generation:**Group multi-discipline teams (developers, product managers, climatologists) to define new features, notification, and the behavior of the system.

- **Goal:** Collect ideas that would not otherwise be obtained through specified conventional requirement gathering process.

## Chapter 4

## Functional Requirements

The **Weather Disaster and Early Warning Application** is an application aimed at providing weather forecast and disaster early warning to weather disasters such as cyclones, tornadoes, heavy rain, floods and the likes. Below are the key functional requirements for the system:

## Real-Time Weather tracking

- **Cyclone Tracking and Alerts:** The system must track cyclones in real-time, providing location-based alerts, including:

    - Predicted path of the cyclone for the next 24 hours.

    - Current intensity and forecasted intensity changes.

    - Storm surge alerts for areas at risk.

- **Heavy Rain and Flood Alerts:** Users must receive alerts for:

  - Real-time rain intensity and forecasts.

  - Potential flooding risks due to heavy rainfall.

- **Tornado Alerts:** The system must provide real-time tornado warnings and expected paths based on location.

## Customizable Notifications

- **Alert Customization:** Users can choose the types of alerts they want to receive (e.g., cyclone, heavy rain, floods) and set the severity threshold for notifications (e.g., high-risk events only).

- **Push Notifications:** The system must deliver timely push notifications to users' mobile devices, ensuring they are immediately informed of potential threats.

## Weather Data Display

- **Weather Maps:** The system must display interactive weather maps that show:

  - Cyclone tracking and intensity.

  - Rainfall distribution and flood-prone areas.

  - Tornado movement and affected areas.

- **Forecast Summary:** Provide users with a summary of weather conditions for the next 24-48 hours for their specified location.

## Search and Location Selection

- **Location Search:** Users must be able to search and select their location manually or enable automatic detection via GPS.

- **Multiple Locations:** Users can save and manage multiple locations (e.g., home, workplace) for which they want to receive weather alerts.

## User Feedback

- **Feedback Mechanism:** Users must be able to provide feedback or report issues within the app (e.g., false alerts, app performance).

- **Ratings and Reviews:** The app must allow users to rate the accuracy of alerts and overall experience.
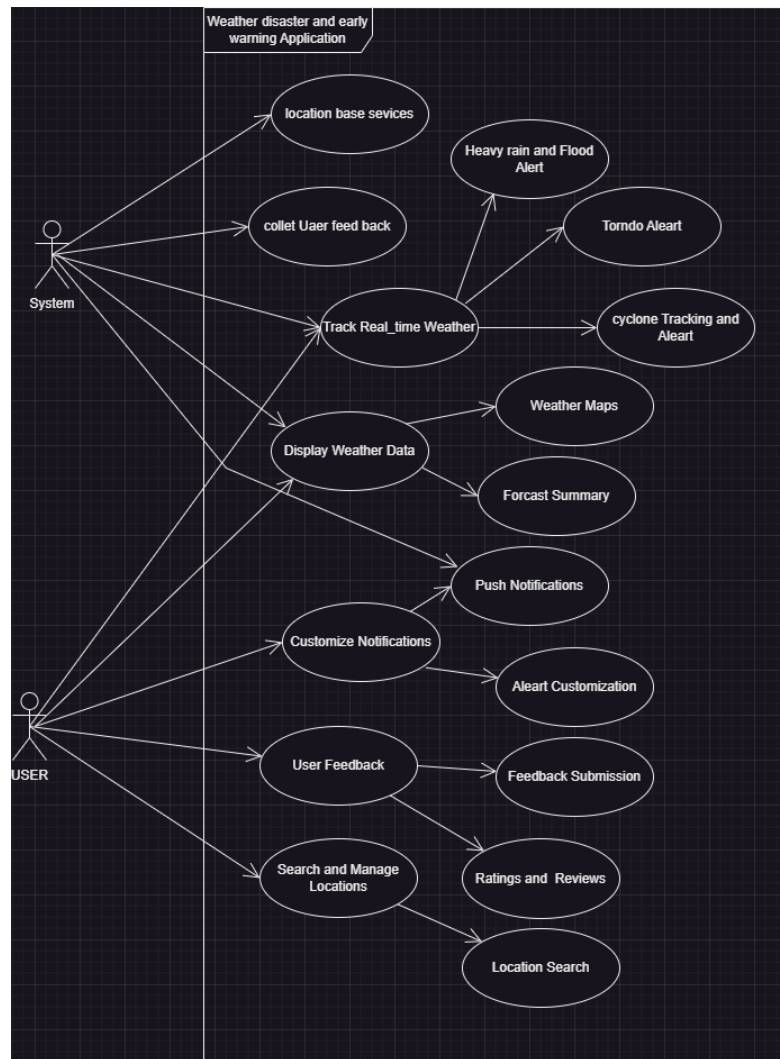
## 4.1   Use Cases



FIGURE 4.1: Usecase of Weather Disaster and Early Warning Application

## 4.2   Action Tables for Use Cases

| Actor | Event | Trigger | Use Case | System Response |
|---|---|---|---|---|
| User | View Real-time Weather | User launches app | Track Real-time Weather | Retrieves and displays the latest weather data to the user |
| User | Receive Weather Alerts | Weather alerts generated based on user location | Push Notifications | Sends heavy rain, flood, tornado, and cyclone alerts based on real-time tracking |
| User | Customize Notifications | User chooses notification preferences | Customize Notifications | Allows user to set preferences for alerts (type, frequency, etc.) |
| User | Submit Feedback | User provides feedback within app | Feedback Submission | Collects and stores user feedback for future analysis |
| User | Search Location | User searches for a specific location | Location Search | Retrieves weather data for specified location |
| User | Manage Favorite Locations | User adds or removes favorite locations | Search and Manage Locations | Allows user to store, update, or delete preferred locations for quick access |
| User | View Weather Forecast | User accesses forecast data | Forecast Summary | Provides summarized forecast information (e.g., hourly, daily) |
| User | Rate and Review | User rates app or leaves review | Ratings and Reviews | Collects and stores user reviews and ratings |
| System | Track Real-time Weather | Continuous real-time updates | Track Real-time Weather | Continuously monitors and updates weather data, tracking potential hazards |
| System | Send Weather Alerts | Hazardous weather detected | Push Notifications | Sends alerts for heavy rain, flood, tornado, and cyclone events |
| System | Display Weather Data | Real-time or requested data update | Display Weather Data | Updates UI with current weather conditions, maps, and relevant alerts |
| System | Collect Feedback | Feedback submission by user | Collect User Feedback | Stores feedback to enhance user experience and system accuracy |

TABLE 4.1: Event Table for Weather Disaster and Early Warning Application

## Chapter 5

### Non Functional Requirement

# Key Non-Functional Requirements

### 1. Performance:

- **Response Time:**They have to get delivered to the users within 10 seconds of identifying a severe weather event.

- **Data Refresh Rate:**Weather information should reflect the current information and therefore should be updated every five minutes.

### 2. Reliability:

- **Availability:**Make sure that the system is always up and running, virtually 99.9% of the time, including some severe weather conditions.

- **Fault Tolerance:**Reassign work to other servers or networks while dealing with server or network problems with ease.

3. **Usability:**

- **Ease of Use:**The application should involve the use of an interface/ graphical user interface that must be basic/ easy to operate/ talent friendly.

- **Accessibility:**Some options to turn into options for the disabled are large text, high-contrast themes, and screen-reader support.

4. **Scalability:**

- **Horizontal Scalability:**Include facility for scaling horizontally in order to handle many users properly.

- **Cloud Integration:**Make use of cloud services in IT infrastructure, so that the resource can be easily obtained as the users change frequently.

# Chapter 6

# External Interface Requirements

# Bibliography