

Industrial Training Report On



## **AgriInfo for Android Phones**

Submitted in partial fulfillment of the requirement for the degree

### **Master of Computer Applications** [Batch 2013 – 2015]

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## Chapter 1. Company profile

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TechnoCloudTechnologies is a group of Young experience professionals with different varied professional experience & background lead by a senior partner, having a rich experience of consulting for more than 6 years with MNC's in US. The firm and its associates have come together to create a team working in multiple areas across domains to cater to an ever increasing array of service mainly in the areas of systems integration & software development. The firm is located in.

TechnoCloudTechnologies has a strong presence in the business consulting domain and an incisive expertise in deploying complex and industry centric business analytical solutions. Our subject matter experts bring diverse experience from across many facets of industry, including data, industry research, consulting and best practices. We help integrate data embedded analytics into business processes to identify weak process links and define targets in terms of processes and quantifiable business value which would improve productivity and efficiency by making it faster and easier to analyze multi-source data and quickly uncover hidden opportunities and risks in business operations.

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## Chapter 2. Project profile

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### ■ Project Description

Purpose behind developing “AgreeInfo” application in android is that any farmer who has android OS enabled mobile device can easily get the information about the crops. Users just need this application installed on their phone. This application will also show the weather.

#### **This system will be helpful in the following ways:-**

- User can easily get the information about the crops from this application.
- User can also get the solution of the problem for the crop.
- User can show the weather information.
- And if there are any queries then user can send his query and get solution from admin.
- User can get facts about current agriculture issues.
- Farmer can connect with other farmer and share the problems and their solutions.
- Farmer can also know about the market price of the crop.

The farmer and he got the problem during his life in farm because of the limited knowledge about the crop and soil. Today there are many solution of the crop problem but farmer can't get this because of the computer problems in villages. But today all farmer use the phone (smart) because so cheap. So they can get information about the crop and soil easily and get more profit. So that is one of the way they can get the all information easily on his mobile and got profit more.

**Scope:** AgrilInfo is revolutionary android mobile application. It enables farmers to access large pool of relevant agriculture information and some of its related topics, at just a click of a button.

There are numerous features of this application with a simple to use interface, which makes it much adoptable. Farmers in turn are able to utilize most of the features effectively to earn maximum benefit.

## ■ Project Category

“AgriInfo” is a mobile application android mobile user can easily install and access. A mobile application is a computer program designed to run on smartphones, tablet computers and other mobile devices. Apps are usually available through application distribution platform, which began appearing in 2008 are typically operated by the owner of the mobile operating system, such as the Apple App Store, Google Play App World.

Mobile apps were originally offered for general productivity and information retrieval, including email, contacts, weather information, crops information, GCM for login and external drive access of sqlite. However, public demand and the availability of developer tools drove rapid expansion into other categories, such as mobile games, factory automation, GPS and location-based services, banking, order-tracking, ticket purchases and recently mobile medical apps. The explosion in number and variety of apps made discovery a challenge, which in turn led to the creation of a wide range of review, recommendation, including blogs, magazines, and dedicated online app-discovery services.

Mobile application development is the process by which application software is developed for low power handheld devices, such as personal digital assistants, enterprise digital assistance or mobile phones. These applications can be pre-installed on phones during manufacturing, downloaded by customers from various mobile software distribution platforms, or delivered as web application using server-side or client side processing to provide an “application like” experience within a Web server.

Application software developer also have to consider a lengthy array of screen sizes, hardware specifications and configurations because of intense competition in mobile software and changes within each of the platform. Mobile apps development has been steadily growing, both in terms of revenues and jobs created. The popularity of mobile apps has continued to rise, as their usage has become increasingly prevalent across mobile phone users.

## ■ System Requirements (Hardware, Software, Network)

The requirements for development and implementation of this application are categorized into following categories.

### ■ Hardware Requirements

#### Client side

Category	Requirement
Device	Android supported
Internal Space	5 MB + Depends on size of application (for installation)
External Space	5 MB + Depends on size of application (for download)

#### Developer side

Category	Requirement
RAM	256 MB
Space on disk	Minimum 256MB

### ■ Software Requirements

#### User side

Category	Requirement
Android version	2.3.3 (Gingerbread) or Higher

#### Developer side

Category	Requirement
OS	Windows XP or higher / Mac OS X 10.5.8 or later / Linux
IDE	Eclipse JUNO
Platform	Android SDK Framework
Android Emulator	SDK Version 2.3.3 or Higher
Technologies used	Java, XML

### ■ Network Requirements

Category	Requirement
Internet Connection	15 kbps or higher

## Chapter 3. Analysis

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### ■ About Existing System (Manual / Automated)

There are number of Android App Stores available in market which provides not just information about which are not in relevant or region data:

- **KisanMitrae**

"KisanMitra" Gujarati apps is designed and developed by Navsari Agricultural University to fulfill the need of farmers community in the area of Agriculture, Horticulture, Veterinary. The content is prepared and compiled by Research Scientist Group of Navsari Agricultural University in Gujarati native language.

- **Horticulture**

Horticulture may be broadly defined as the Science and art of growing fruits, vegetables and flowers and crops like spices condiments and other plantation crops. It is a science of cultivation of Garden plants, Currently apps describes how to do cultivation, Irrigation, Planting and Soil and climate. and providing the weather details.

- **Modern Kheti**

Modern Kheti, as the name indicates, relates to the modern agricultural techniques; conservative and cash crops, allied professions and farm machinery through training programs or upcoming events on a national and international level. Introduced in 1987, it is the leading and most widely read agriculture based magazine throughout Northern India.

## ■ Feasibility Study

Feasibility study is a test of system proposal according to its work ability, impact on the organization, ability to meet user needs, and effective use of resources. The objective for this phase is not to solve the problem but to acquire a sense of scope. During the study, the problem definition is crystallized and aspects of the problem to be included in the system are determined.

The main purpose of feasibility study is to consider each and every possible factor associated with the project and determine whether the investment of time and other resources yield desired results. It also includes determining the investments, manpower and costs incurred of this project. The following feasibility has used in this project.

Mobile Application Development Systems are capital investments because resources are being spent currently in order to achieve benefits to be received over period of time following completion. There should be a careful assessment of each project before it is begun in terms of economic justification, technical feasibility, operational impact and adherence to the master development plan. We started the project by listing the possible queries that the user might want to be satisfied. And on these lines we guided the project further.

The three main points, kept in mind at the time of project are:

- Possible (To build it with the given technology and resources)
- Affordable (Given the time and cost constraints of the organization)
- Acceptable (For use by the eventual users of the system)

The three major areas to be constrained while determining the feasibility of a project are:

1. Technical Feasibility
2. Operational Feasibility
3. TimeLine Feasibility

## ■ Technical Feasibility

The technical issue usually raised during the feasibility stage of the investigation includes the following:

- ✓ Does the necessary technology exist to do what is suggested?
- ✓ Do the proposed equipment have the technical capacity to hold the data required to use the new system?
- ✓ Will the proposed system provide adequate response to inquiries, regardless of a number or location of users?
- ✓ Can the system be upgraded if developed?
- ✓ Are there technical guarantee of accuracy, reliability, ease of access and data security?

Earlier no systems existed to cater to the need of Secure Infrastructure Implementation System. The current system developed technically feasible. It is a web based user interface, thus it provides an easy access to users. Permissions to the users would be granted based on the roles specified. Therefore, it provides the technical guarantee of accuracy, reliability and security. The software and hardware requirements for the development of this project are not many and are already available as free as open source. The work for the project is done with current equipment and existing software technology. Necessary bandwidth exists for providing a fast feedback to the users irrespective of the number of users using the system.

## ■ **Operational Feasibility**

Under this category of service we conduct a study to analysis and determine whether your need can be fulfilled by using a proposed solution. The result of our operational feasibility Study will clearly outline that the solution proposed for your business is operationally workable and conveniently solve your problems under consideration after the proposal is implemented. We would precisely describe how the system will interact with the system and persons around.

Our feasibility report would provide result of interest to all stakeholders. It will do as per the needs of the business requirements.

## ■ **Timeline Feasibility**

It is important to understand that a need must be fulfilled when it has to be. Some otherwise feasible and highly desirable projects can become non-feasible due to very restrictive timeline constraints. This fact makes it imperative that milestone are clearly linked to the timeline and projects are will conceived with sage unforeseen margins. We make sure that we strictly follow what has been stated above.

## ■ **Limitations of the Existing Systems**

Various applications provide agricultural information, but all the information is in English language. So, illiterate farmers are not able to take advantage of these services.

If some literate farmers want to access app or website but then a laptop or PC is mandatory.

There are many agencies that provide agriculture information via sms or call but they charge money for the usage of their services.

As this application is developed on Androidplatform it cannot be executed on I-OS orBlackberry platform based Device.

## ■ Scope of the Proposed Systems

AgriInfo is an innovative way of enhancing farmers access towards actionable technologies. The core purpose of this application is to provide actionable information including Activities , Weather Forecasts, etc. AgriInfo believes that this app will empower the whole chain in taking timely decisions including making their deals.

AgriInfo is revolutionary android mobile application. It enables farmers to access large pool of relevant agriculture information and some of its related topics, at just a click of a button.

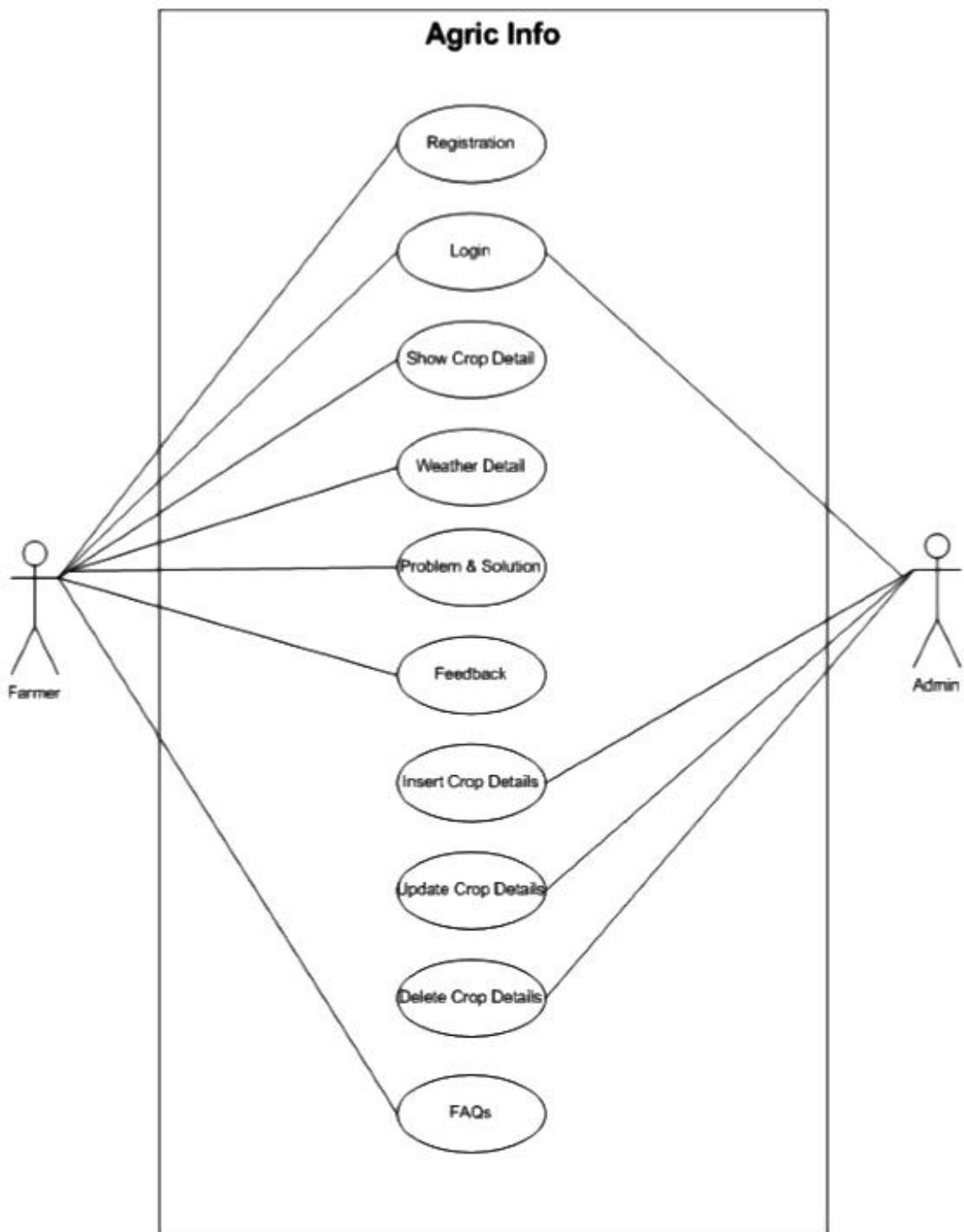
## ■ Limitations of the Proposed Systems

The application uses Web service for different operations, so the device must have Internet connection to run this application.

If the user request to download any application instead of the device is running without SD card, the application will starts the download if the required space is available in the internal storage of the device.

## ■ Use Cases

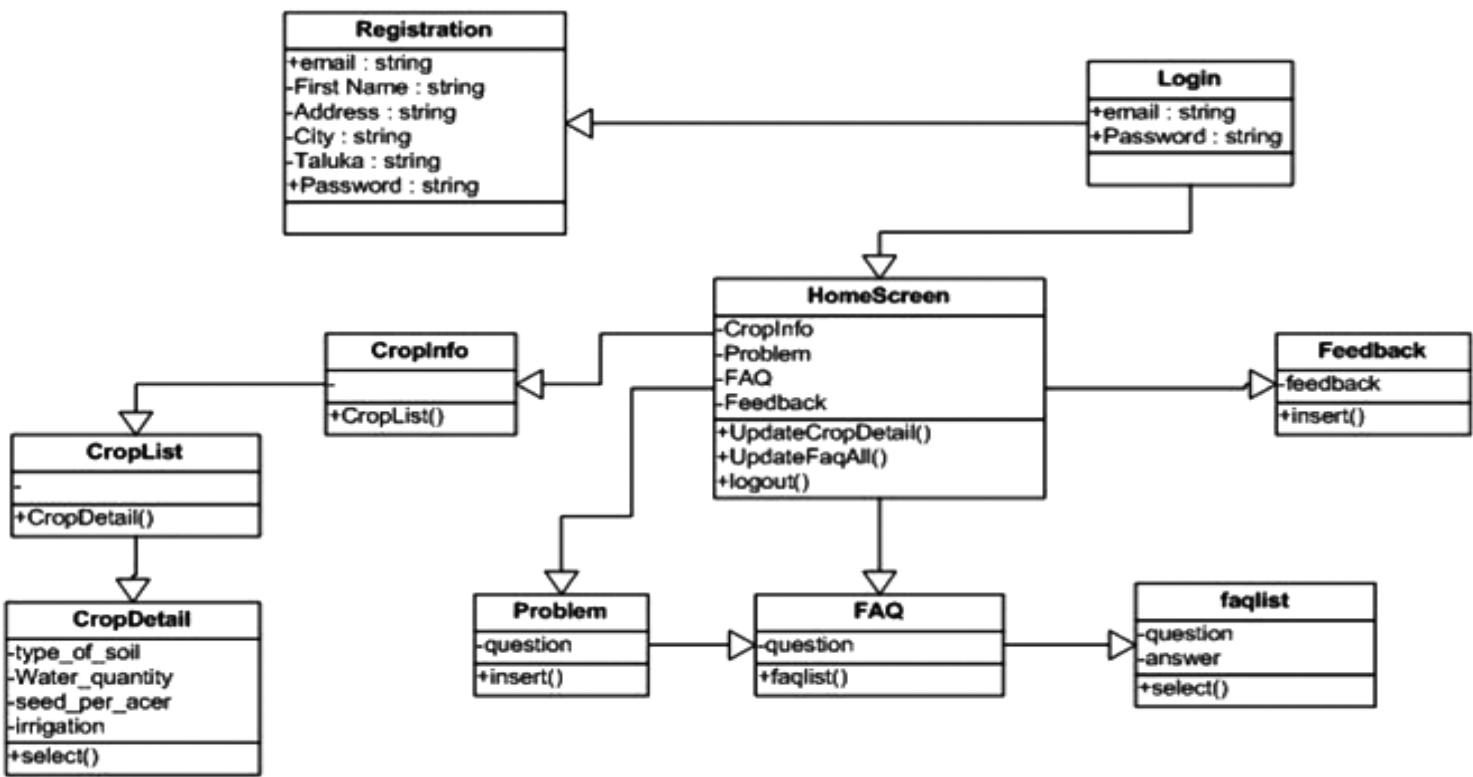
Use case diagram is the first step of software requirement analysis to final achievement, and it expresses how people use a system. Use case shows users, what kind of service users require and services are offered by client to the system. It helps client to have a better understanding of functions in these element and also benefits to achieve them. Use case diagram is commonly used to describe system and sub-system.



1: Use Case Diagram - Modules

## Class Diagram

Data requirement is meant to be the data that will be used in this application.



2: Class Diagram - AgrilInfo

In the UML (Unified Modeling Language), class diagram is a type of static structure diagram which describes the structure of a system by showing classes, attributes, operations and the relationships between the classes of a system. It is the main building block in object oriented modeling.

The classes represent both the main objects and/or interactions in the application. The class diagram consists of classes which are represented in boxes which contain three parts. The name of the class is contained in the upper part, with the attributes of classes in the middle part and the bottom part contains the methods or operations that the classes undertake.

## ■ Software Requirement Specification

### ■ Data Requirement

Data requirement is meant to be the data that will be used in this application. Data required in this application project are user's primary email address, user's country, device brand, and device model and device version.

### ■ Functional Requirement

In order to make this application functional, we require the following.

- **User Registration**

The user should be able to register to the system, after downloading and installing the yeTango application. For registration, there is no need to user input as the application will get the user's primary email address which is already authenticated. The system will also get the country of user, device model, and device version and device brand.

- **Select Application**

The user should be able to select any application from the given set of Apps and Games. After selecting the application, the system provide brief description, screenshots and other related information to user.

- **Download Application**

The user should be able to download any application if the required space for application is available in SD card or internal storage.

- **Install Application**

The user should be able to install any application after completion of download for that application.

- **Open Application**

The user should be able to open any application inside the system and/or outside the system after success full completion of downloading and installing for that application.

- **Uninstall Application**

The user should be able to uninstall any installed application from inside and/or outside the system.

- **Update Application**

The user should be able to update any application if update is available for any installed application.

- **Search Application**

The user should be able to search for any Apps and Games from any activity of the application.

- **User's Application**

The user should be able to show User's applications which include all installed applications in device, all downloaded applications from the system, and all apps which have updates available.

## ■ **Performance Requirement**

The requirements in this section provide a detailed specification of the user interaction with the software and measurements placed on the system performance.

- **Search Feature**

The search feature should be prominent and easy to use for the user. The feature should be provided in all the activities of the entire application so that user can search for application from any activity.

- **Usage of Web service**

The Web service should be used easily for different operations in the application. All these Web service must be called for specific purpose.

- **Response time**

The response time for the response of Web service should not be more than 10 seconds if user have a proper internet connection.

- **Fault Tolerance**

The fault tolerance of the system should be very good. If the application loses connection to the Internet or the system gets some strange input, the user should be informed.

## ■ **System Dependability**

Following are the requirement that an application require from the device/mobile on which it is installed.

- **Internet Permission**

Application developed, require full Internet permission of mobile so that it can fetch application, its information and other data from the server.

- **External SD Card Writable Permissions**

This application would be requiring to read and write access to SD card. It is required to store downloaded application and again retrieve to install it from SD card.

- **Account Info**

The application fetches user's primary Google account information in order to get the unique authenticated email address.

- **Access Network State**

The application checks for internet connection every time the application will launch. If the internet connection is not available, the error message will be shown.

## ■ **Maintainability Requirements**

Following are the maintainability requirements of yeTango mobile application.

- **Application extendibility**

The application should be easy to extend. The code should be written in a way that it favors implementation of new functions. It is required in order for future functions to be implemented easily to the application.

- **Application testability**

Test environment should be built for the application to allow testing of the applications different functions.

## ■ **Look and Feel Requirements**

Regarding look and feel, our user are straight forward. They believe in simplicity. So following are their requirements.

- **Simple and Light**

The user interface should be simple and lightly colored. It should give relaxing effect on looking at its GUI. No bright colors should be used while designing the UI of this application.

- **Easy to use**

The application should be easy to use. If any user is doing something wrong, he/she should be informed correctly, what is going wrong behind the scene? There should be proper instruction for the user to use this application.

## **■ Validation**

Any Application is useless without validation. Following are the validations implemented in proposed system.

- **Internet Connection Validation**

The application should check the internet connection before proceed any function. If the internet connection is not available, the error message should be shown.

- **Validation before download**

Before downloading any application, user's primary email address should be checked to register the user download on server.

- **Validation on selecting App**

Before loading any application data on selecting app, the system will check for selected application, if it's installed then open and uninstall button shown, if not then install button provided, and if the app is installed and the new update for that app is available, the update button will be provided.

## Chapter 4. Design

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### ■ Design Approach

A design approach is a general philosophy that may not include a guide for specific methods. Some are to guide the overall goal of the design. Other approaches are to guide the tendencies of the designer. A combination of approaches may be used if they don't conflict

**Function Oriented Design Approach:** Function Oriented Design Approach is partitioning of a design into subsystem and modules, with each one handling one or more functions. Contrast with object-oriented design, data structure oriented design.

This application projects uses function oriented design approach. Every module and sub modules are made, based on their functionality. These modules are designed and implemented separately and then they are integrated together to form the desired application.

### ■ Design Details

The detailed design of this application is as follow:

#### 1. Splash Screen

The first step in this application is to check the internet connection every time user opens the application project. If the Internet connection is not available, the dialog showing message "No Internet Connection found" with "retry" button will be shown to user. This is the first screen of an application when splash screen run the all values of database are fetch from MySQL and store in the SQLite Database and after that redirect to login page..

#### 2. Viewing Home Screen

There are many options like cropinfo, weather, problem, FAQ, feedback, etc. To use any options just click on that icon button. There are also one Logout button, if user click on the logout button than he has to do login again when he launch application and if not do logout than no needs to do login again.

#### 3. Login Page

When users launch the application first time he has to do registration first for that he has to click on the Submit Button.

#### 3. Registration Page

To use the application user has to do register his self and do login to use the application.

#### **4. Types of Crops**

This screen is display the list of buttons with crop name. User can click on the button which crop information he want. After clicking on the button he redirect to the crop detail page.

#### **5. Crops Information**

This screen is display the crop details like type of soil, water quantity, Seeds per Acer, and Irrigation Facility. Here in this page individual crops information are change.

#### **6. Weather**

When you click on the weather button this screen open. This screen is display the weather of the Gujarat. When you click on the weather button it redirect to the weather website and display the Gujarat state's weather.

## ■ Activity Diagram

Activity diagram is another important diagram in UML to describe dynamic aspects of the system. Activity diagram is basically a flow chart to represent the flow from one activity to another activity.

The activities on the diagram can be described as an operation of the system. So the control flow is drawn from one operation to another. This flow can be sequential, branched or concurrent. Activity diagram deals with all type of flow control by using different elements like fork, join etc.

### ***Purpose:***

The basic purposes of activity diagrams are similar to other four diagrams. It captures the dynamic behavior of the system. Other four diagrams are used to show the message flow from one object to another but activity diagram is used to show message flow from one activity to another.

Activity is a particular operation of the system. Activity diagrams are not only used for visualizing dynamic nature of a system but they are also used to construct the executable system by using forward and reverse engineering techniques. The only missing thing in activity diagram is the message part.

It does not show any message flow from one activity to another. Activity diagram is sometimes considered as the flow chart. Although the diagram looks like a flow chart but it is not. It shows different flow like parallel, branched, concurrent and single.

## ■ Registration

User enters his details in registration form and after submits detail, all data store in database.

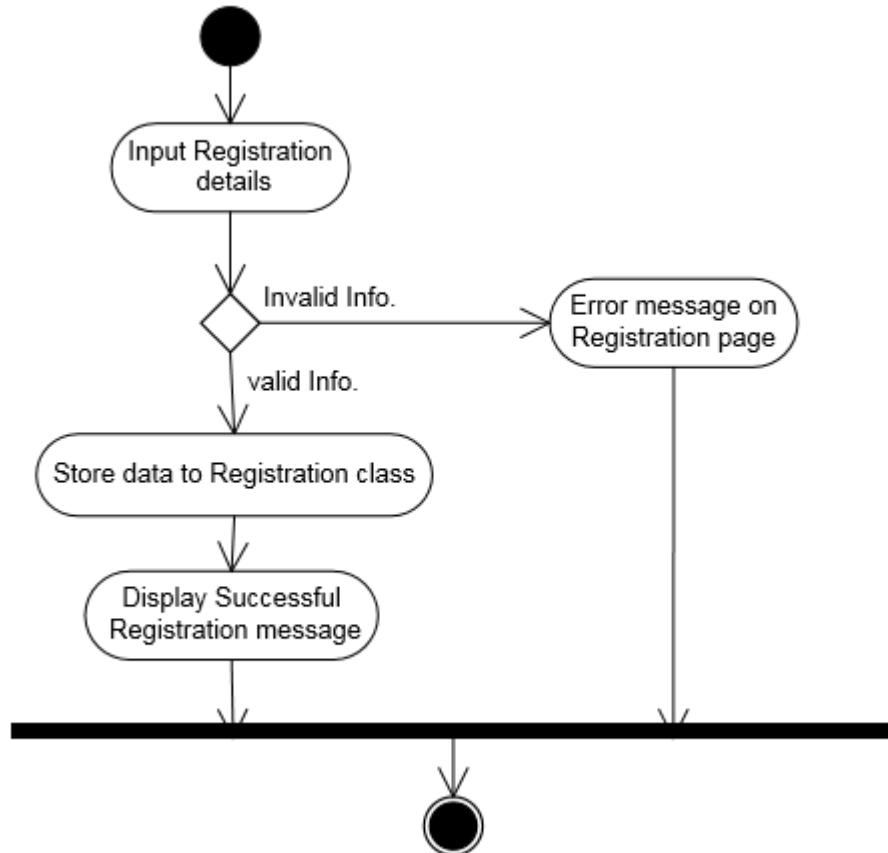


Figure 8: Activity Diagram - Registration

## ■ Login

User enters his email id and password in login form if both are same than redirect to home page otherwise give error message.

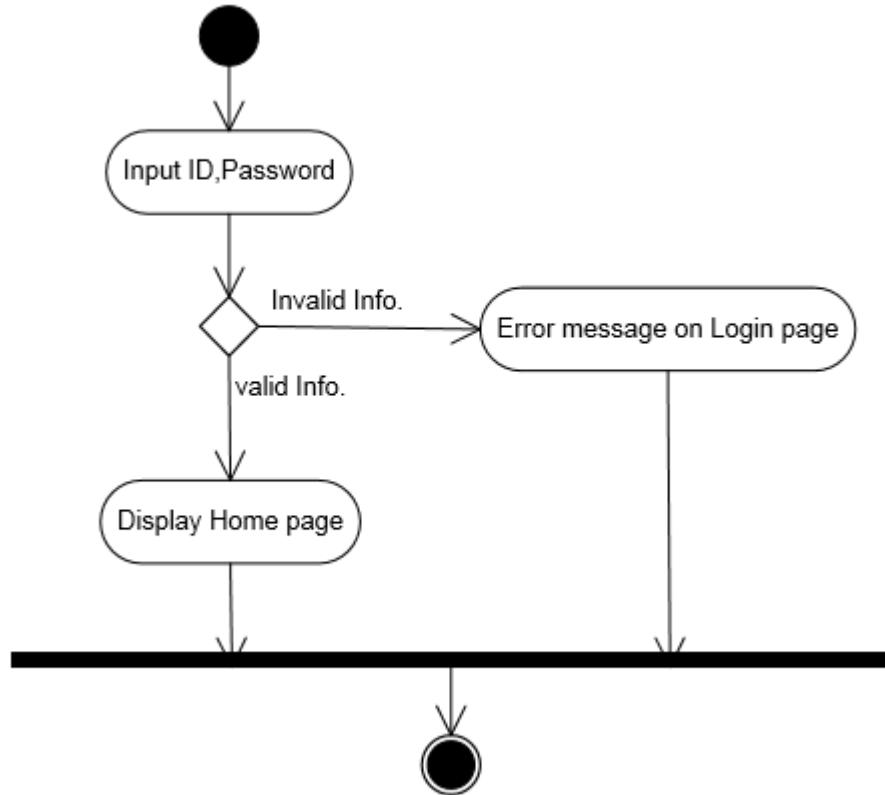


Figure 9: Activity Diagram –LoginScreen

## ■ Crop Info

When User click on the crop Button the list of crop buttons are display and click on that, the detail about that crop is display.

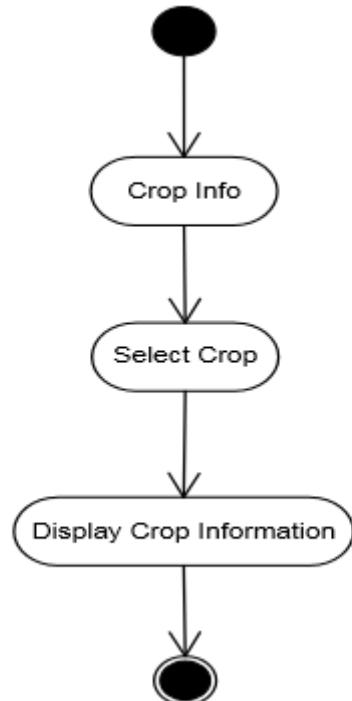


Figure 10 : Activity Diagram –Crops Info

## ■ Weather

When User click on the Weather Button the weather site open which is display the information about the Gujarat city’s weather only.

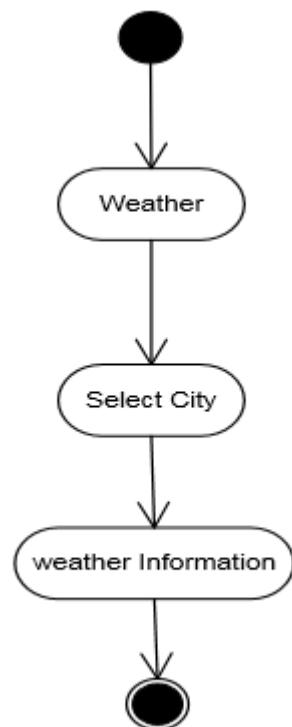


Figure 11: Activity Diagram –Weather

## ■ Problem

User enters his problem in this form and after submits problem, it stored into the database.

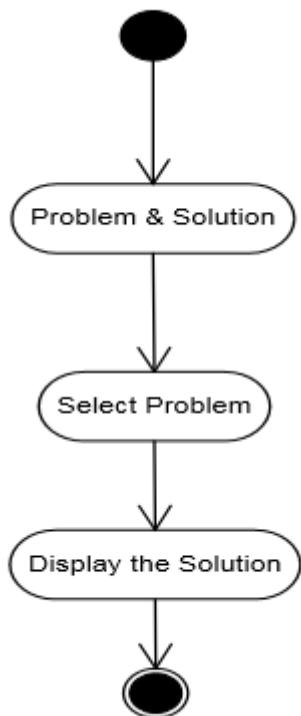


Figure 12: Activity Diagram - Problem

## ■ Sequence Diagram

Sequence diagram describes object interaction and lays emphasis on message sequence. In other words. It shows how messages will be sent and received among the objects. There are two coordinate axes, y axes (Vertical) represents time and the x axes (Horizontal) represents objects.

### ■ Registration

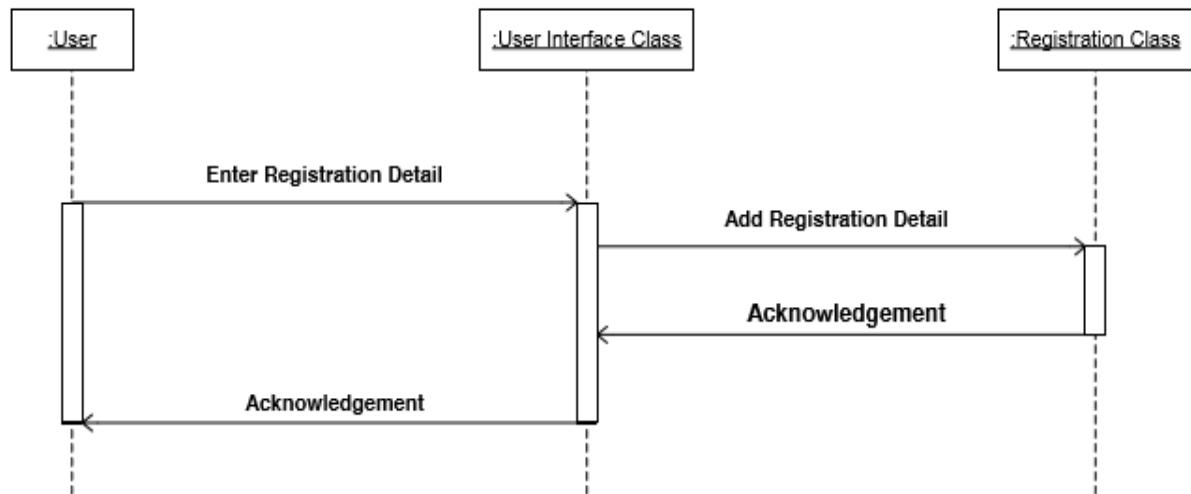


Figure 13: Sequence Diagram –Registration

## ■ Login

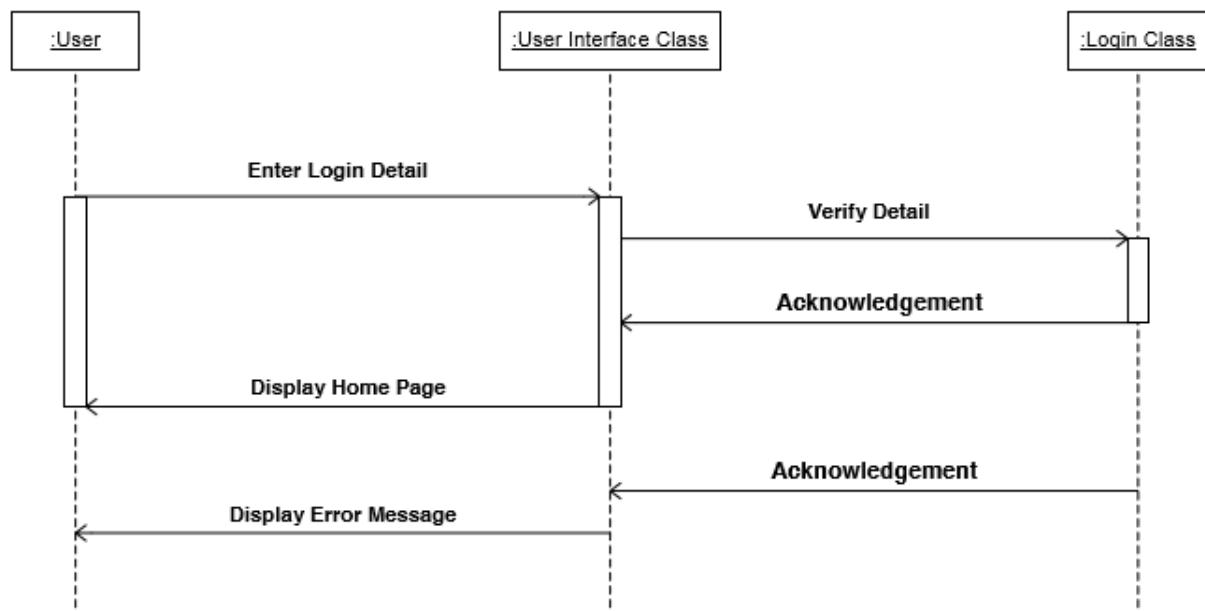


Figure 14: Sequence Diagram – Login

## ■ Problem Solutions

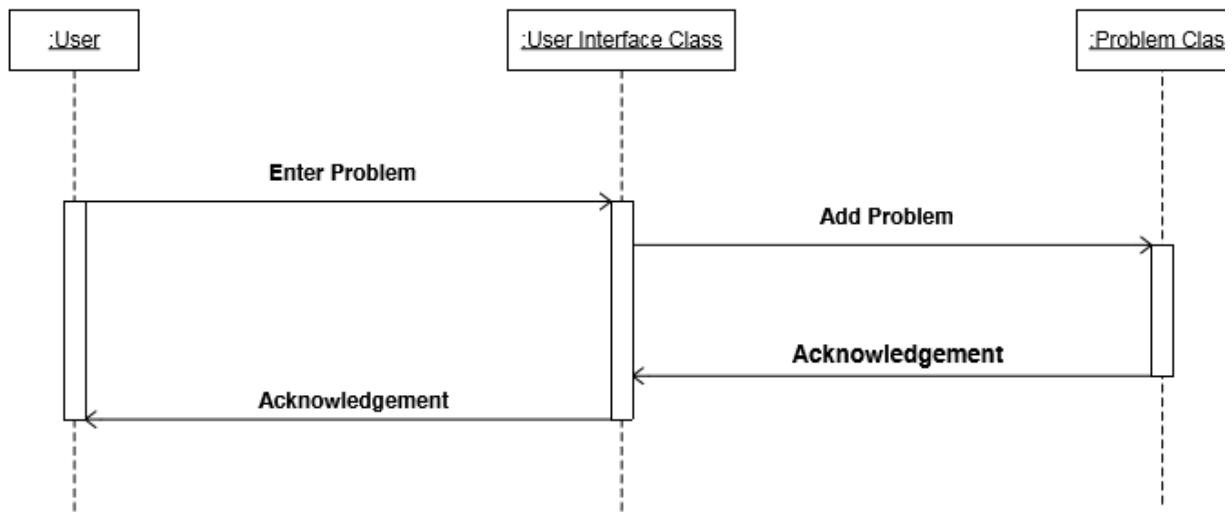


Figure 15: Sequence Diagram –Problem Solution

## Feedback

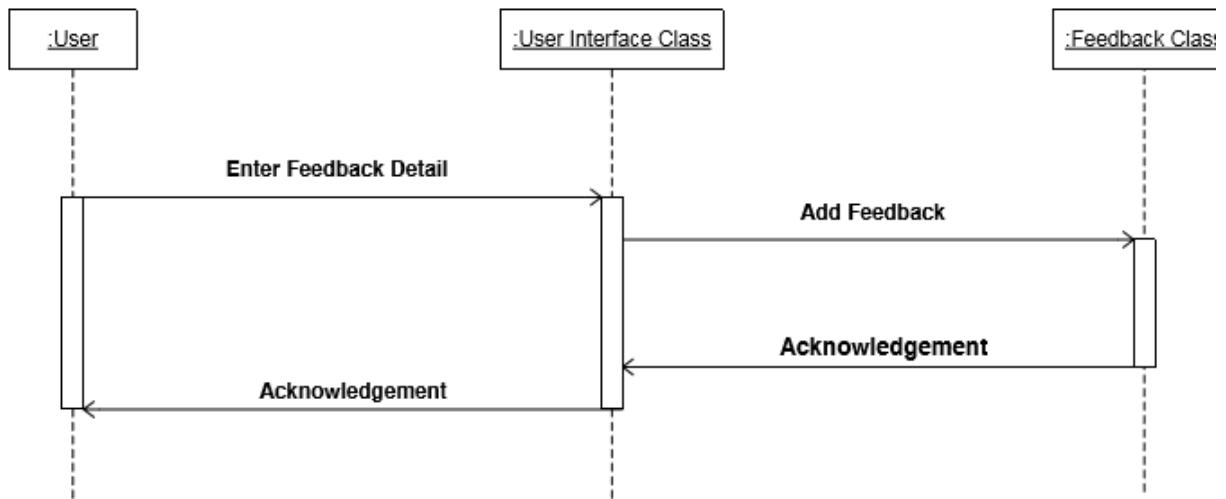


Figure 16: Sequence Diagram –Feedback

## Chapter 5. Testing

### ■ Screenshot

A test plan can be defined as a document describing the scope, approach, resources, and schedule of intended testing activities. It identifies test items, the features to be tested, the testing tasks, who will do each task, and any risks requiring contingency planning.

- **Test Strategy**

We have followed black box testing. Short description about black box testing is as follow:

Black-box testing is a method of software testing that tests the functionality of an application as opposed to its internal structures or workings. Specific knowledge of the application's code/internal structure and programming knowledge in general is not required. Test cases are built around specifications and requirements, i.e., what the application is supposed to do. It uses external descriptions of the software, including specifications, requirements, and designs to derive test cases. These tests can be functional or non-functional, though usually functional. The test designer selects valid and invalid inputs and determines the correct output. There is no knowledge of the test object's internal structure.

- **Test Cases, Test Data and Results**

ID	Field	Input	Expected output	Actual Output	Result
1	Email-ID	""	Invalid username	Invalid username	Pass
2	Email-ID	abc.com	Invalid username	Invalid username	Pass
3	Email-ID	abc@gmail.com	Valid username	Valid Username	Pass
4	Password	""	Invalid Password	Invalid Password	Pass
5	Password	Asbhb(wrong password)	Invalid Password	Invalid Password	Pass
6	Password	Akbari(right password)	Valid Password	Valid Password	Pass

- **Registration**

ID	Field	Input	Expected	Actual Output	Result
4	Enter Name	""	Invalid Name	Invalid Name	Pass
5	Enter Name	User1	Valid Name	Valid Name	Pass
6	Enter Address	""	Invalid Name	Invalid Name	Pass
7	Enter Address	Mahalaxmi Society, Varachha	Valid Address	Valid Address	Pass
8	Password	""	Invalid Password	Invalid Password	Pass
9	Password	Akbari	Valid Password	Valid Password	Pass
10	Conform Password	""	Invalid Conform Password	Invalid Conform Password	Pass
11	Conform Password	Asxcv	Invalid Conform Password	Invalid Conform Password	Pass
12	Conform Password	Akbari	Valid Conform Password	Valid Conform Password	Pass

- **Intended Readership:**

This document covers the way of using Agric Info by the following users: ->Those who need to get the information about the crops.

- >Those who need to get the weather detail.
- >Those who want the solutions of the crops problems.
- >Actual use of this application is farmer.

- **Acronyms:**

SUM: Software User Manual

UI: User Interface

## ■ Splashscreen



## ■ Login



## Home Screen



## Types of Crops



## Crop list info



- જાતોના પસંદગી
- જાત માટેનો અનુકૂળ વિસ્તાર
- રાસાયણિક ખાતર
- દેશી ખાતર
- પાકની મુખ્ય જીવાત અને નિયંત્રણ
- ઉત્પાદન
- પાકની અગત્યતા
- જમીન અને આબોહવા
- વાવણી અને પદ્ધતિ
- પોષણ વ્યવસ્થાપન
- રોગ વ્યવસ્થાપન
- પિયત વ્યવસ્થાપન

## Crop Informations



આતર વ્યવસ્થાપનરાસાચિક ખાતરો માટે નીચે  
મુજબની ભલામણ છે. સુધારેલી સ્થાયી જાતો : ૮૦  
ડિલો નાઈટ્રોજન + ૪૦ ડિલો ફોસ્ફરસજુવારની  
વાવણી સમયે ફોસ્ફરસનો પુરેપુરો જથ્થો અને  
નાઈટ્રોજનનો અડધો જથ્થો આપવો. જુવારની વાવણી  
બાદ ૩૦-૪૦ દિવસ બાદ લેજની ઉપલબ્ધતા પ્રમાણે  
નાઈટ્રોજનનો બાકીનો જથ્થો પૂર્ણ ખાતર તરીકે  
આપવો. દાણાની ફૂગા:

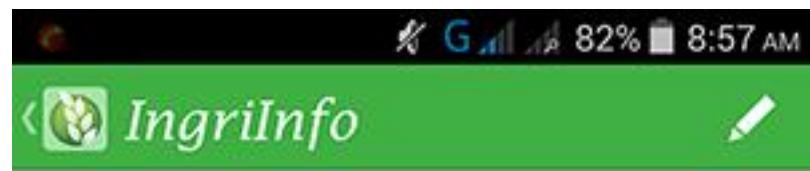


દક્ષિણ ગુજરાતમાં દાણાની ફૂગ એ એક ગંભીર  
સમસ્યા છે. દક્ષિણ ગુજરાતમાં વરસાદ વધારે થાય છે  
અને ચોમાસુ ઓકટોબર સુધી લંબાય છે. આ સમયે  
સુધારેલી વહેલી પાકતી જાતો પાકવાની તૈયારીમાં  
હોય છે. આવી પાકી ગયેલી અથવા પાકવા આવેલી  
જુવાર ઉપર કમોસમી વરસાદ પડવાથી અને લેજમય  
વાતાવરણ થવાથી દાણા ઉપર ફૂગ આવી જાય છે.

## Drawer Navigation



## ■ Problems (Question)



Question

Submit

## Weather



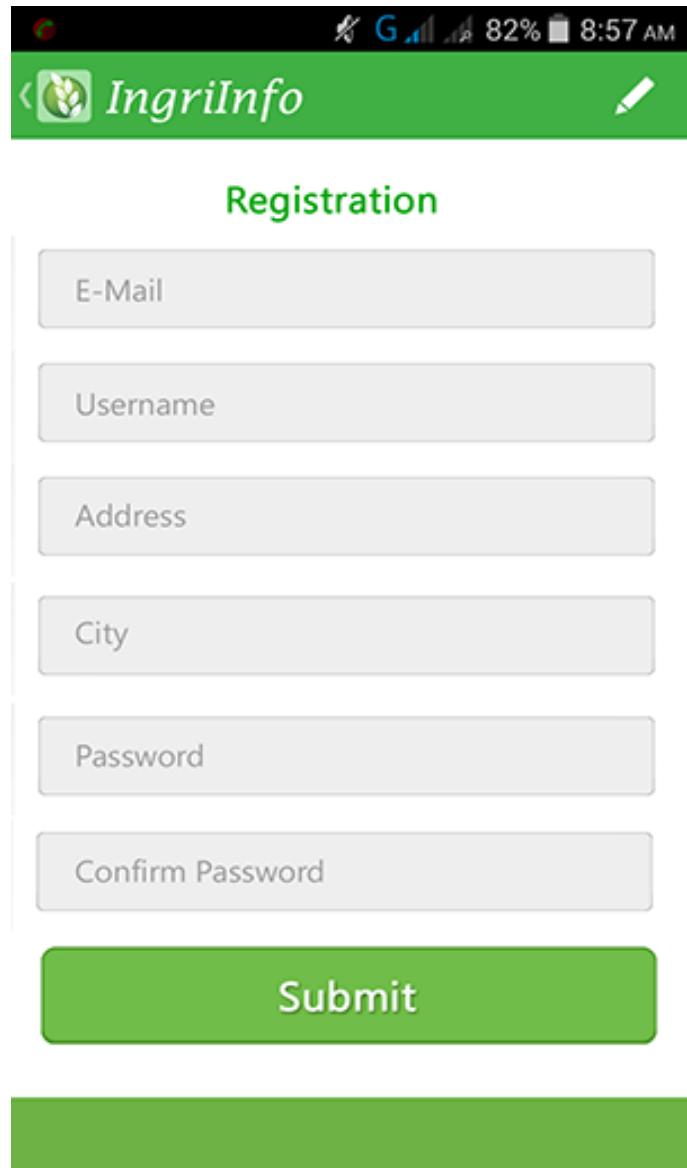
Rajkot

5 DAY FORECAST    NEXT 24 HOURS

Day	Weather	Max. Day (°C)	Min. Night (°C)	Wind (mph)	Humidity	Pressure	Visibility
Tue		21	9	1	31%	1029mb	> Poor
Wed		21	10	3	43%	1029mb	> Poor
Thu		22	13	3	69%	1033mb	> Good
Fri		24	11	3	59%	1032mb	> Good
Sat		24	16	2	51%	1032mb	> Very good

Last updated at 08:35, Tuesday 18 May

## ■ Registration



## Profile



# Prakash Gujarati

Developer

## GENERAL INFORMATION

### Work

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### Mobile

960-102-6377



### Email Address

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### Address

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Bh. Ranitower, Kalawad Road, Rajkot



## OTHER INFORMATION

### Person Notes



## Chapter 6. About the tools

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### ■ Language, IDE's, Tools and Technologies used

#### ■ Java

Java is a very popular programming language developed by Sun Microsystems. Developed long after C and C++, Java incorporates many of the powerful features of those powerful languages while addressing some of their drawbacks. Still, programming languages are only as powerful as their libraries. These libraries exist to help developers build applications.

Some of the important features of Java are:

- It's easy to learn and understand.
- Designed to be platform independent and secure, using virtual machines.
- Object oriented

Android relies heavily on these Java fundamentals. The android SDK includes many standard Java libraries (data structure libraries, math libraries, graphic libraries, networking libraries and more) as well as special Android libraries that will help to develop awesome Android Applications.

#### *Platform Independence Importance*

With many programming languages, we need to use a compiler to reduce code into machine language that the device can understand. While this is well and good, different devices use different machine languages. This means that we might need to compile our applications for each different device or machine language in other words, our code is not very portable. This is not the case with Java. The Java compiler convert our code from human readable Java source files to something called byte code in Java. These are interpreted by a JVM (Java Virtual Machine), which operated much like a physical CPU might operate on machine code, to actually execute the compiled code.

Although it might seem like this is inefficient, much efforts has been put into making this process very fast and efficient. These efforts have paid off in that Java performance in generally second only to C/C++ in common language performance comparisons.

Android application run in a special virtual machine called the Dalvik Virtual Machine. While the details of this VM are unimportant to the average developer, it can be helpful to think of the Dalvik VM as a bubble in which android application runs, allowing us to not have worry about whether the device is Motorola Droid, HTC One or the latest android devices. We don't need care so long as the device is Dalvik VM friendly that the device manufacturers job to implement, not ours.

## ■ **Android Development Tools**

- **Android SDK**

The Android Software Development Kit (Android SDK) contains the necessary tools to create, compile and package Android applications. Most of these tools are command line based. The primary way to develop Android application is based on the Java programming language.

- **Android Debug Bridge (ADB)**

The Android SDK contains the Android Debug Bridge (ADB), which is a tools that allows us to connect to a virtual or real android device, for the purpose of managing or debugging the device or debugging the application.

- **Android Developer Tools and Android Studio**

Google provides two Integrated Development Environments (IDEs) to develop new applications. The Android Developer Tools (ADT) are based on the Eclipse IDE. ADT is a set of components (plug-ins), which extend the Eclipse IDE with Android Development Capabilities. Google also supports an IDE called Android Studio for creating Android Applications. This IDE is based on the Intel IDE.

Both IDEs contains all required functionality to create, compile, debug and deploy Android applications. They also allow the developer to create and starts virtual Android devices for testing. Both tools provide specialized editors for android specific files. Most of Android's configuration files are based on XML. In this case, these editors allow us to switch between the XML representation of the file and a structured user interface for entering the data.

- **Android Runtime (ART)**

With Android 4.4, Google Introduced the Android Runtime (ART) as optional runtime for android 4.4. It is expected that version after 4.4 will use ART as default runtime. ART uses Ahead of Time compilation. During the deployment process of an application on an Android Device, the application code is translated into machine code. This results in approximately 30% larger compile code, but allows faster execution from the beginning of the application.

## ■ Security and Permissions in Android

- **Security**

The Android system installs every Android application with a unique user and group ID. Each application file is private to this generated user, e.g., other applications cannot access these files. In addition each Android application is started in its own process.

Therefore, by means of the underlying Linux kernel, every Android application is isolated from other running applications. If data should be shared, the application must do this explicitly via an Android component which handles the sharing of the data, e.g., via a service or content provider.

- **Permissions**

Android contains a permission system and predefines permissions for certain tasks. Every application can request required permissions and also defines new permissions. For example, an application may declare that it requires access to the Internet.

Permissions have different levels. Some permissions are automatically granted by the Android system, some are automatically rejected. In most cases the request permissions are presented to the user before installing the application. The user needs to decide if these permissions shall be given to the application.

If the user denies a required permission, the related application cannot be installed. The check of the permission is only performed during installation, permission cannot be denied or granted after the installation.

An android application declares the required permissions in its `AndroidManifest.xml` configuration file. It can also define additional permissions which it can use to restrict access to certain components.

## ■ About Web service

Web service is a system that enables applications to communicate with an API. Web service helps to expose business logic through an API interface where different systems communicate over network. At higher level there are two parties involved, party providing the service is web service provider and the one utilizing it is web service consumer.

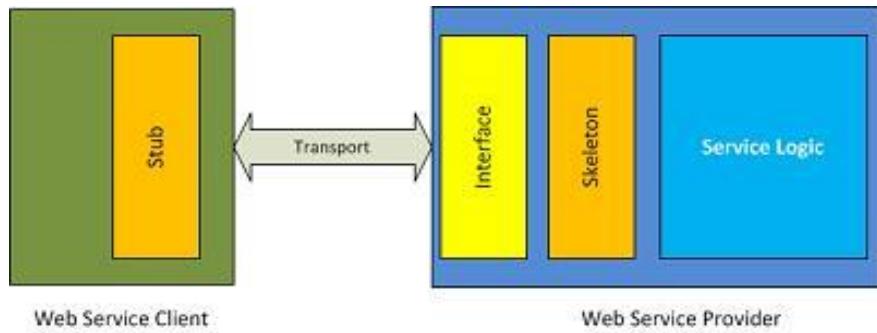


Figure 18: Web service

## How Web Services Work

A web service is a technique by which two applications can communicate with each other, regardless of platform or programming language. The web service usually requires some data or argument to be passed to it; the service performs some kind of process on that data, and finally the web service returns the data in a specific format defined in the web service's programming.

Web services are a useful shortcut for adding the maximum number of features to any web application in the shortest possible time. Instead of building a feature for any application from scratch, in many cases a better option is to invoke a publicly available web service directly from your application.

Suppose I want to provide a search facility that visitors to my website can use. I *could* build my own search application from scratch, but that would be a lot of work, ranging from building a database of information to developing various indexing and hashing features. Instead, I can use the Google Search web service on my website. The web service accesses Google's info database in response to the visitor's search, and it returns the requested results to the visitor.

A web service consists of several methods that are advertised for use by the general public. To make it possible for every application to access a web service, these services use web service protocols, including REST, SOAP, JSON-RPC, JSON-WSP, XML-RPC, and so on. A web service can exchange data in any format, but two formats are the most popular for data exchange between applications:

**XML.** Standard format for data exchange among applications, in order to avoid data type-mismatch problems.

**JavaScript Object Notation (JSON).** Text-based open standard for representing data. Uses characters such as brackets ([]), braces ({}), colons (:), and commas (,) to represent data.

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<http://play.google.com>
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[www.tutorialspoint.com](http://www.tutorialspoint.com)
- **Github**<http://github.com>