

Software Requirement Specification Document

Cell Tower Placement System

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1 Introduction

1.1 Purpose of this document

The main purpose of this Software Requirements Specification document is to outline the requirements for Cell Tower Placement System: detect the best location for pointing a new antenna and to extend on the existing one. This is done with the aid of our system. This document will provide a detailed overview of our system product's parameters and goals and explain purpose and the features of Cell Tower Placement System and describes its interfaces, hardware, software requirements and explains what the system will do. This software requirements specification (SRS) document defines how our stakeholder and team see the product and its functionality.

1.2 Scope of this document

This Software Requirements Specification (SRS) is the requirements work product that formally specifies Cell Tower Placement System. The proposed system aims to find the finest places to deploy cell-towers and help companies to decrease the cost of surveys.

1.3 Overview

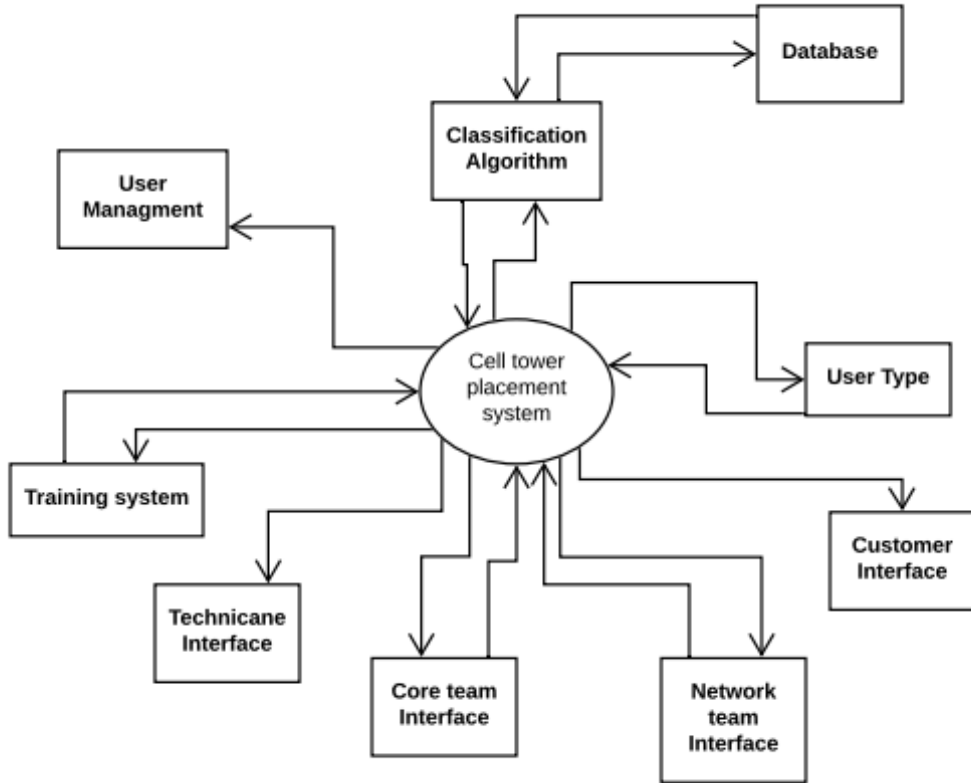


Figure 1: Context Diagram

The project aim is to find the best location for placing a cell tower, by finding the best building with the best dimensions and network coverage, by using GPS and extract the needed features. After that we make some measurements such as (Distance between buildings, population of the location, distance between the building and the base station and network coverage from this building). Also the system after that decides which building is suitable to place on it the cell tower by machine learning.

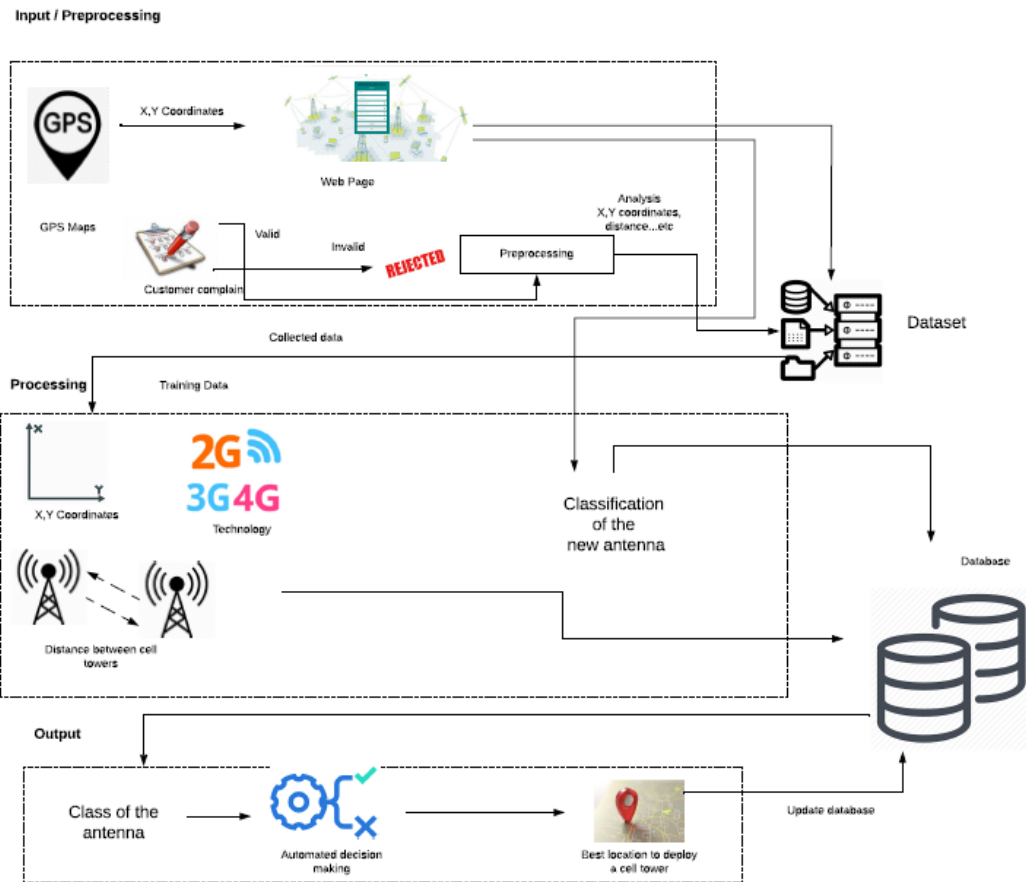


Figure 2: Overview Diagram

The purposed system a Cell Tower Placement system used to find the best location as a X,Y coordinates by using GPS maps or by a complain. Thereafter, it is passed through a pre-processing phase to know network coverage, distance and other parameters needed. Then, the collected data is classified into Excel sheets to use it on GPS. To get the final integrated results. Eventually, the integrated results used in the automated decision to get the best location as a X,Y Coordinates.

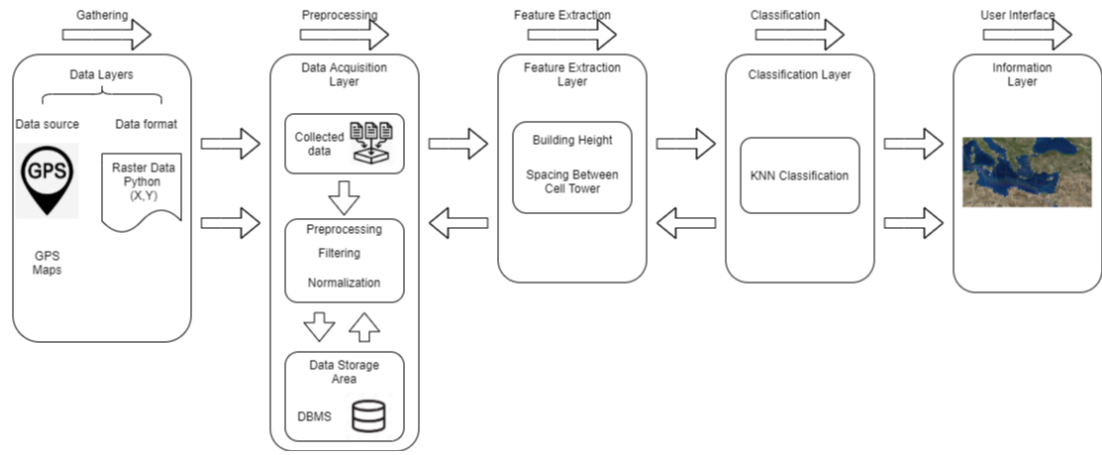


Figure 3: Block Diagram

1.4 Business Context

Decrease paperwork, decrease the timing in making costly surveys to find the best location . It also ends the role of the workers. The mission of the project is the easiness in applying an antenna/cell tower without coasting any money.

2 General Description

2.1 Product Functions

1. Customer can do a complain on the area that have error in network.
2. Network team can validate the customer complain.
3. Network team can set X,Y coordinates to the core team.
4. System Admin can set requirements.
5. Technician can get the best location from the core team.
6. Core team can find and defer antenna by pointing another one or extend it.
7. Core team can plan to find the best location.

2.2 Similar System Information

IBWave software that is used to support the network designers to select the location of the antenna. The standard for converged indoor network planning, As the global industry reference, the software allow for planning, design and

deployment of any project regardless of size or technology. Along with innovative software, are recognized for world class support in 90 countries, industry's most comprehensive components database and a well-established certification program.

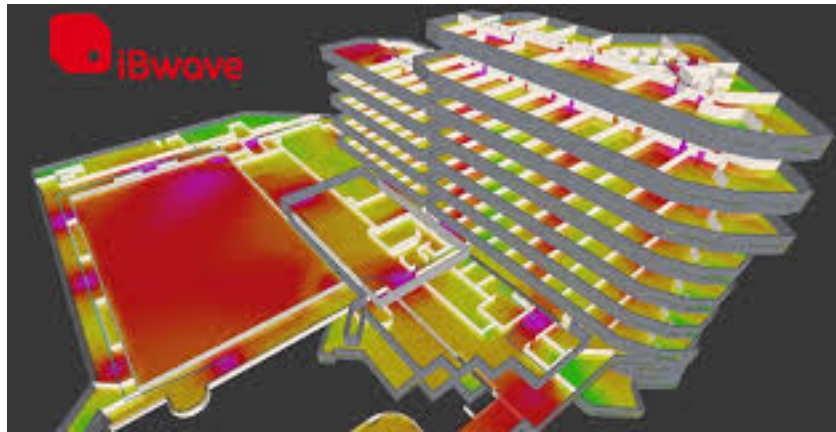


Figure 4: Picture of the IBWave

2.3 User Characteristics

1. Customer:
 - Must have basic knowledge in using web applications.
2. Network team:
 - Must have the knowledge in using web applications and maps.
 - Must have the knowledge to differentiate the valid complain from the invalid.
3. Core team:
 - Must have the knowledge in using web applications and maps.
 - Know the existing antenna.
4. System Admin:
 - Must have the knowledge in using web applications.
5. Technician:
 - Must have the knowledge in using web applications and maps.

2.4 User Problem Statement

Finding the accurate place to fix over cell tower station costs mobile operators big chunks of money. Our target is to provide automated cell tower allocate system.

2.5 User Objectives

By using the Cell tower placement, the user can pin X,Y Coordinates to know if this is the accurate placement for a cell tower. And the system will take the decision.

2.6 General Constraints

One of the main constraints of the system is the automated decision. Only by giving the system X,Y coordinates and show if it is the accurate placement or not. Doesn't any workers to know the place. So doesn't consume time. Also, more accurate.

3 Functional Requirements

FR1

Title	Sign up
Description	Registration function for the engineer in the company who are in charge for the antenna management and allocation
Input	Name , Email , Password , Telephone , Gender
Action	Check all fields are filled and submit the data
Output	Home Page and Acceptance message or error message
Pre-condition	None
Post-condition	Redirect to the home page and update the database with a new record
Dependencies	None

Table 1

FR2

Title	Log in
Description	For existing engineers to log into accounts
Input	Username and password
Action	Check if all fields are filled and compares data entered to the record in the database
Output	Home Page and Acceptance message or error message
Pre-condition	None
Post-condition	Redirect to the home page
Dependencies	FR1

Table 2

FR3

Title	View report
Description	Users may report weakness of signal in certain locations so these reports are archives by the customers service to enhance the service
Input	None
Action	Retrieve reports from database
Output	Reports page containing all reports
Pre-condition	None
Post-condition	Reports page
Dependencies	FR1 FR2

Table 3

FR4

Title	Report location
Description	Cropping part of the map surrounding the report location and displaying it
Input	X, Y-Coordinates for the report location
Action	Taking the X,Y-Coordinates as an input and adding some values to them to crop the surrounding area
Output	Certain map for report location
Pre-condition	None
Post-condition	Certain map page
Dependencies	FR1 FR2

Table 4

FR5

Title	Find Antenna
Description	Some antennas may be available for renting and broadcasting through it and this is a cheaper and better option than finding place for new antenna
Input	X,Y-Coordinates
Action	Searching for antennas nearby the location that are available for renting
Output	Suitable antenna and its location
Pre-condition	Defining the antennas in the dataset whether it belongs to the company or not
Post-condition	Marking the antenna on the map
Dependencies	FR1 FR2

Table 5

FR6

Title	Finding best location
Description	Searching for the best location to place the antenna to enhance or cover new area according to the regulations
Input	X,Y-Coordinates
Action	Filtering locations and building to find the best location according to certain parameters and a well-trained data-set
Output	Multiple suggestions for most appropriate locations
Pre-condition	Normalized data set where all attributes are well defined
Post-condition	Marking the best locations on the map
Dependencies	FR1 FR2

Table 6

FR7

Title	View map
Description	Displaying the whole map for the country displaying a layer containing all the antennas
Input	None
Action	Retrieving the map associated with antennas dataset using GIS tool plug in
Output	Map showing the antennas
Pre-condition	None
Post-condition	Map page
Dependencies	FR1 FR2

Table 7

FR8

Title	Add Engineer
Description	Adds new engineer to the system
Input	Name , Email , Password , Telephone , Gender , National ID
Action	Check if all fields are filled and insert an object in a database.
Output	Acceptance message or error message
Pre-condition	Check if the engineer exists
Post-condition	New engineer is created
Dependencies	FR1 FR2

Table 8

FR9

Title	Editing an engineer's record
Description	This function edits the engineer existing information to the system
Input	Name , Email , Password , Telephone , Gender , National ID
Action	Make sure that the record of the engineer is updated.
Output	Acceptance message or error message
Pre-condition	Check if the engineer exists
Post-condition	The record of the engineer is updated into the database
Dependencies	FR1 FR2

Table 9

FR10

Title	Deleting an engineer's record
Description	This function deletes the engineer's record
Input	Name
Action	Make sure that the record of the engineer is deleted
Output	Acceptance message or error message
Pre-condition	Check if the engineer exists
Post-condition	The record of the engineer is deleted from the database
Dependencies	FR1 FR2

Table 10

FR11

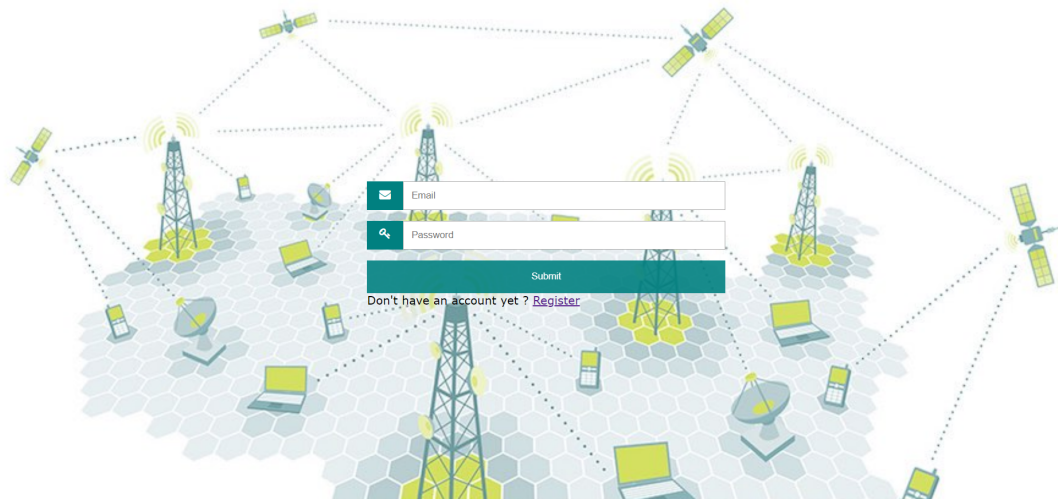
Title	Searching for an engineer record
Description	This function searching for an engineer record
Input	Name
Action	Retrieves information about the engineers
Output	Preview engineer's record
Pre-condition	Check if the engineer exists
Post-condition	None
Dependencies	FR1 FR2

Table 11

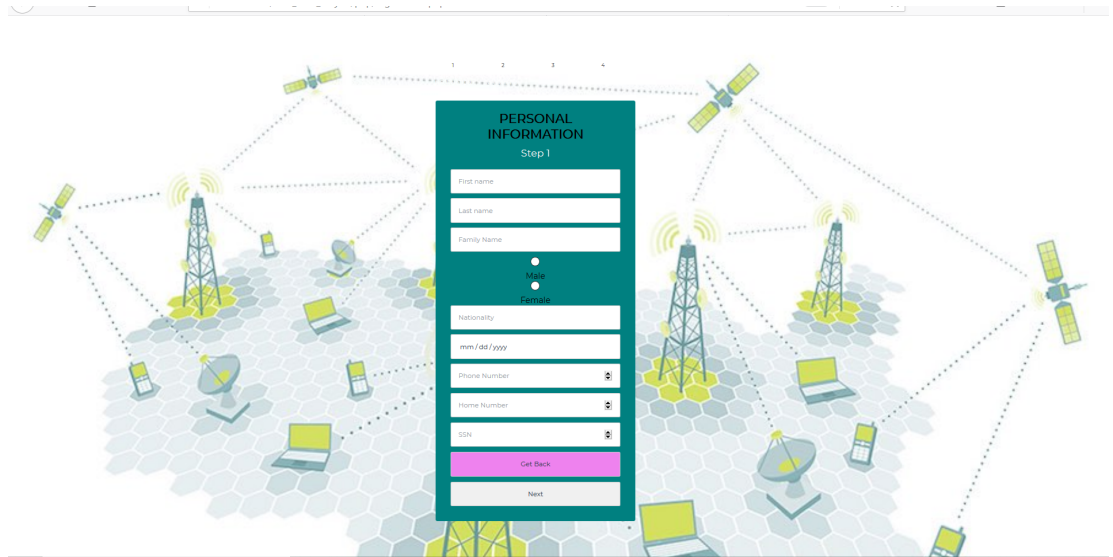
4 Interface Requirements

4.1 User Interfaces

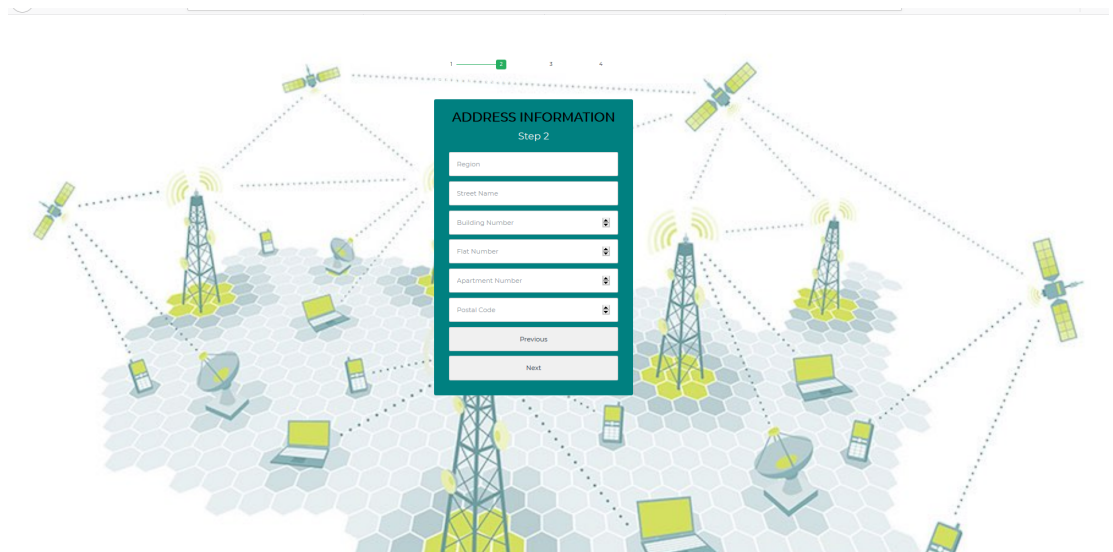
4.1.1 GUI



Login Figure.



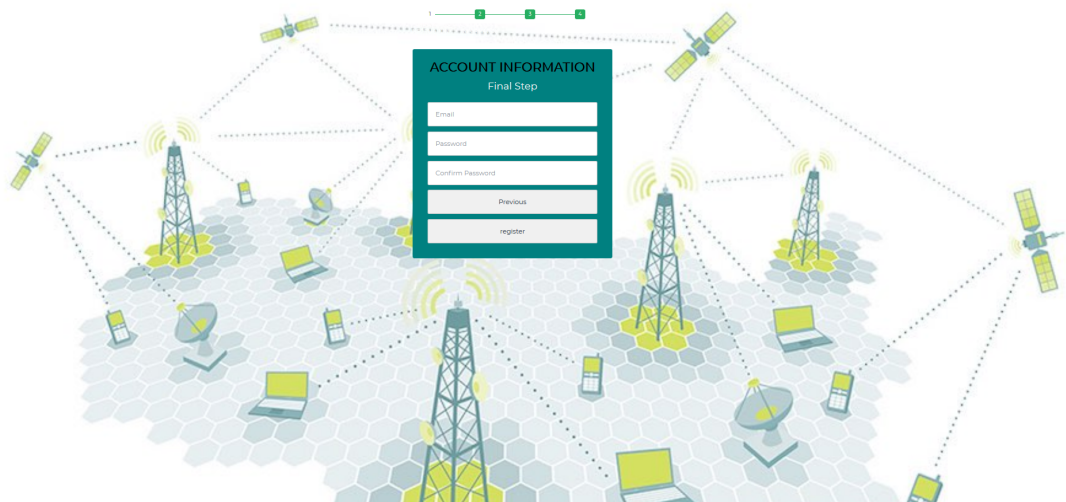
Sign-Up Figure.



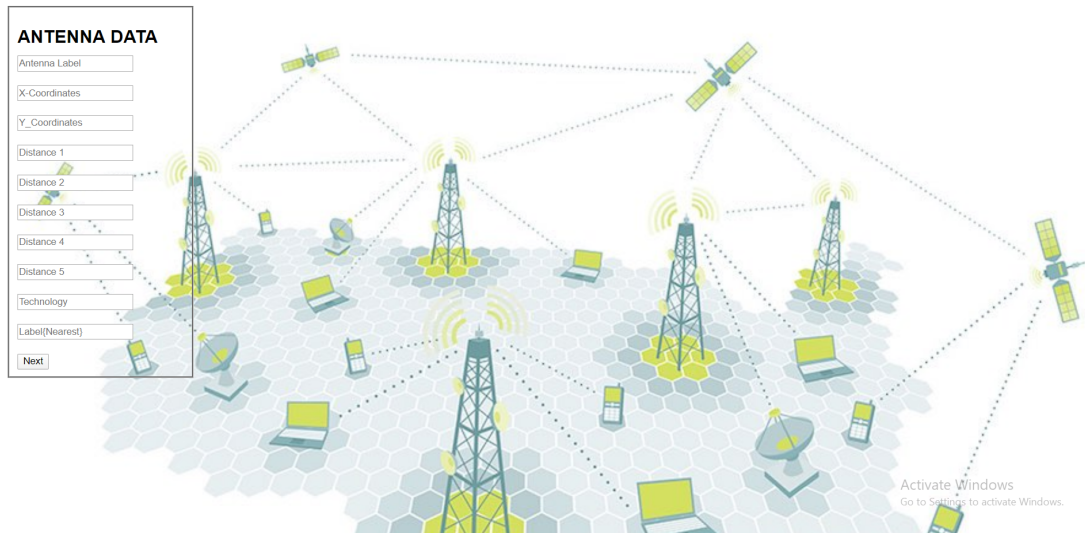
Sign-Up Figure.



Sign-Up Figure.



Sign-Up Figure.



Antenna Data Figure.

4.2 Communications Interfaces

The communication interface is one of the most important requirements of our software as it will need a connection to the internet or a local host connection.

5 Performance Requirements

For Cell tower placement, the system shall be able to conform the X,Y coordinates that entered by the user for the placement of a cell tower. The system must be able to handle a large data-set to ensure system accuracy. Sample run time for the different parameter in data-set.

6 Design Constraints

Any Computer that include stable internet connection to deal with Google Maps .

6.1 Hardware Limitations

Windows 10 , Minimum processor Inter i7 , preferable to have RAM Memory 16GB , 64-bit processing operating system , enough hard-drive .

7 Other non-functional attributes

7.1 Security

Our app deals with a credential data and private data for each telecommunication company so there must be difficult allowance and authentication for the users or engineers who will use the app, also the data set must be hashed and stored in secured database.

7.2 Performance and Speed

Cell tower placement app must be speed and powerful as it is based on well-trained data-set so the more the data-set is accurate and trained the more the app is powerful and fast.

7.3 Reliability

The Cell Tower Placement is reliable. It must make sure that the system is reliable in its operations. This would be mainly in detection of best location and classification . As GIS readings should be accurate and error free. Also data-set should be normalized.

7.4 Scalability

The Cell Tower Placement is scalable. It should be easy to maintain to minimize the amount of changes that would be done to the code.

7.5 Usability

Proportion of functionalities or tasks mastered doesn't need time to be learned. Also, this system is easy to be memorized due to the small number of tasks the user will do.

8 Preliminary Object-Oriented Domain Analysis

8.1 Inheritance Relationships

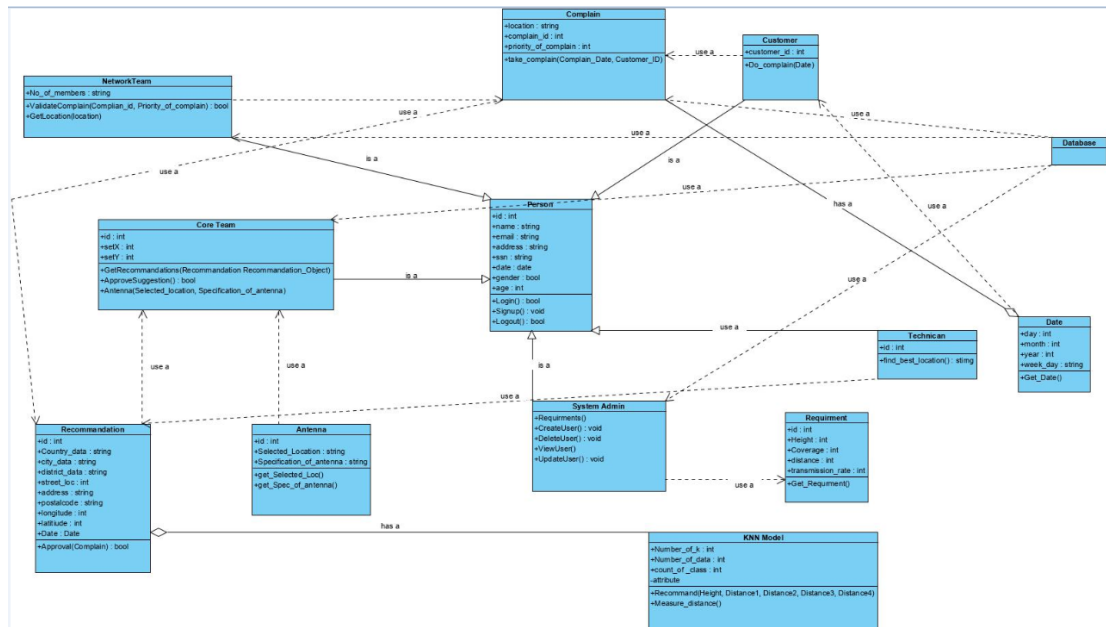


Figure 11: Class Diagram For System.

9 Operational Scenarios

1. Scenario 1: Customer complain

The customer send a complain. Then the network team start to validate this complain and set X,Y coordinates by the area of the customer.

2. Scenario 2: System process

The network team set X,Y coordinates for a new place or from a valid complain. The system gives the core team the existing antennas to know if they need to be extended or to point a new one. So, the system gives the best location to both core team and technician.

3. Scenario 3: System admin set the requirements

The System admin set the requirement that will be needed such as the network coverage, distance and other parameters that will help the core team to find antennas or to work on pointing a new one.

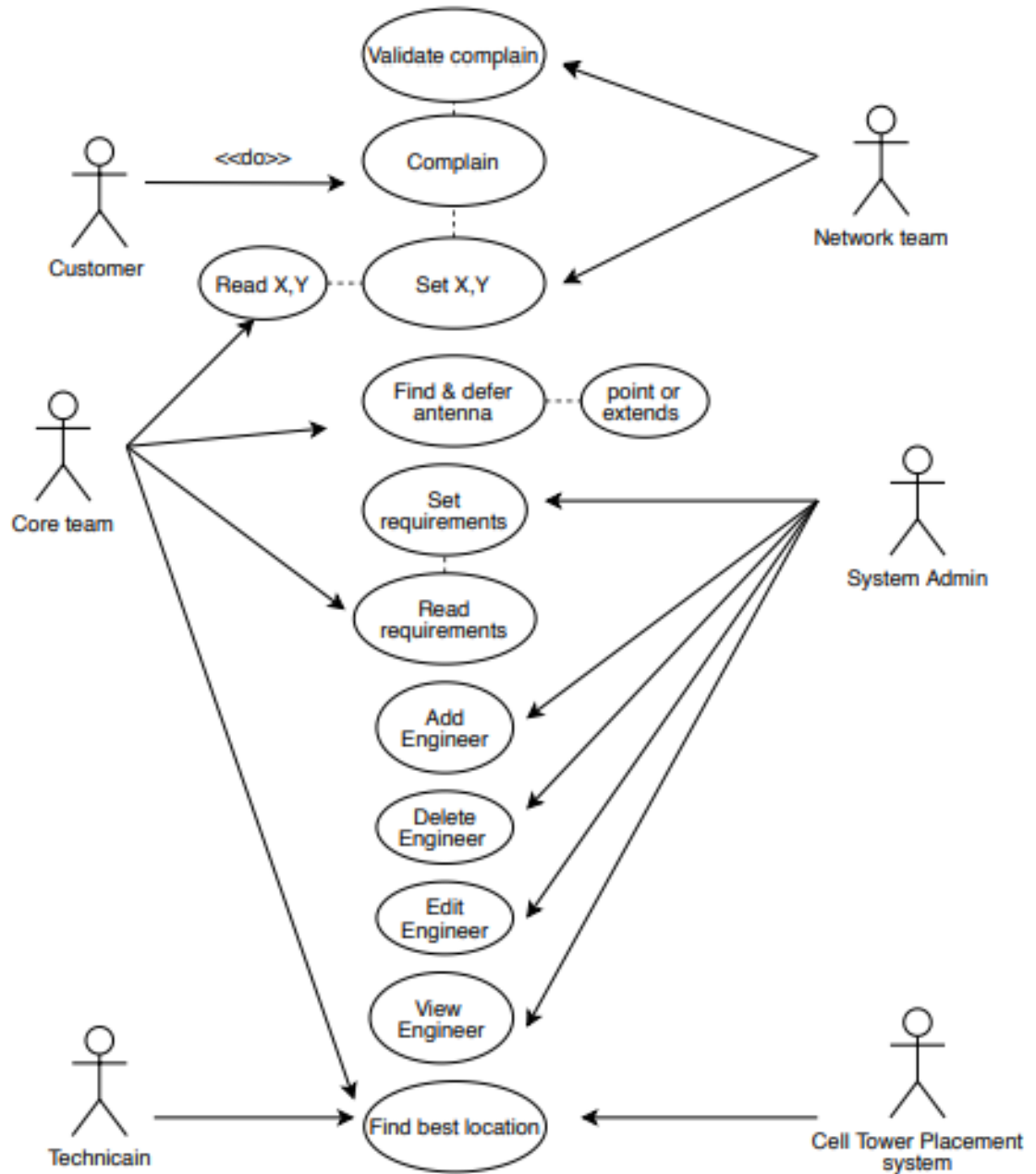
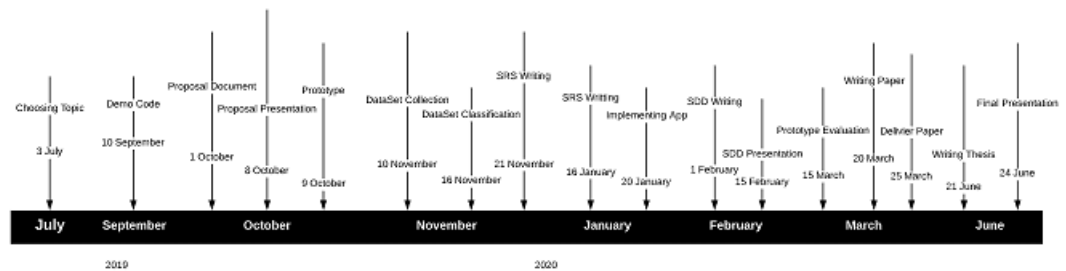


Figure 12: Use case Diagram for System.

10 Preliminary Schedule Adjusted



11 Preliminary Budget Adjusted

No budget needed yet.

12 Appendices

12.1 Definitions, Acronyms, Abbreviations

Cell Tower: A cell tower, or cellular base station is a cellular-enabled mobile device site where antennae and electronic communications equipment are placed—typically on a radio mast, tower, or other raised structure—to create a cell in a cellular network.

12.2 Collected material

13 References

13.1 1

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