

LAB REPORT

Submitted by
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Under the Guidance of

Dr.Ms. RANJANI

In partial satisfaction of the requirements for the degree of

**BACHELOR OF TECHNOLOGY
in
COMPUTER SCIENCE ENGINEERING**

with specialization in cse-core



SCHOOL OF COMPUTING

**COLLEGE OF ENGINEERING AND TECHNOLOGY
SRM INSTITUTE OF SCIENCE AND TECHNOLOGY**

KATTANKULATHUR - 603203

MAY 2023



SRM INSTITUTION OF SCIENCE AND TECHNOLOGY KATTANKULATHUR-603203

BONAFIDE CERTIFICATE

Certified that this Course Project Report titled Weather forecasting ^{System} is the bonafide work done by S.Vamsi Varshini, who carried out under my supervision. Certified further, that to the best of my knowledge the work reported herein does not form part of any other work.

M. Dny
8/5/23

SIGNATURE

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ABSTRACT

Weather forecasting systems play a vital role in predicting the atmospheric conditions and providing advance warnings for potential weather hazards. These systems utilize various data sources, including satellite imagery, weather balloons, and ground-based sensors, to develop predictive models for weather patterns.

In this abstract, we present an overview of weather forecasting systems, including their components, data sources, and modelling techniques. We also discuss the challenges associated with weather prediction, such as the complexity of atmospheric dynamics and the uncertainties associated with data collection and modelling.

Additionally, we highlight the importance of accurate weather forecasting for a wide range of applications, from agriculture and transportation to disaster preparedness and response. Finally, we conclude with a discussion of ongoing research efforts to improve weather forecasting accuracy and to develop more robust and scalable weather forecasting systems for the future.

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School of Computing

SRM IST, Kattankulathur – 603 203

Course Code: 18CSC206J

Course Name: Software Engineering and Project Management

Experiment No	1
Title of Experiment	To identify the Software Project, Create Business Case, Arrive at a Problem Statement
Name of candidate	SARAGADAM VAMSI VARSHITH
Team Members	KOTIKALAPUDI TULASI VENKATA BHADRA GANESH
Register Number	RA2111003011782
Date of Experiment	25/01/2023

Mark Split Up

S.No	Description	Maximum Mark	Mark Obtained
1	Exercise	5	5
2	Viva	5	2
Total		10	7

Staff Signature with date

Aim

To Frame a project team, analyze and identify a Software project. To create a business case and Arrive at a Problem Statement for the weather forecasting system.

Team Members:

S. No	Register No	Name	Role
1	RA2111003011782	SARAGADAM VAMSI VARSHITH	Lead/Rep
2	RA2111003011769	KOTIKALAPUDI TULASI VENKATA BHADRA GANESH	Member

Project Title: WEATHER FORECASTING SYSTEM



Project Description:

Weather forecasting is the application of science and technology to predict the state of the atmosphere for a given location. Ancient weather forecasting

methods usually relied on observed patterns of events, also termed pattern recognition. For example, it might be observed that if the sunset was particularly red, the following day often brought fair weather. However, not all of these predictions prove reliable. Here this system will predict weather based on parameters such as temperature, humidity and wind. This system is a web application with an effective graphical user interface. User will login to the system using his user ID and password. User will enter the current temperature; humidity and wind, System will take this parameter and will predict weather from previous data in the database. The role of the admin is to add previous weather data in the database, so that the system will calculate weather based on these data. Weather forecasting system takes parameters such as temperature, humidity, and wind and will forecast weather based on previous records therefore this prediction will prove reliable. This system can be used in Air Traffic, Marine, Agriculture, Forestry, Military, and Navy etc.

ONE PAGE BUSINESS CASE TEMPLATE

DATE	25/01/2023
SUBMITTED BY	SARAGADAM VAMSI VARSHITH
TITLE / ROLE	WEATHER FORECASTING SYSTEM/MEMBER

THE PROJECT.

- This project stores the upcoming weather of future 7 days .which is very useful for the farmers ,navy(air force),and in many other ways.
- Weather warnings are important forecasts because they are used to protect life and property.
- Daily and Intraday forecasts. Current and Time-series observations (e.g temperature, precipitation, wind, barometric pressure, visibility, ultraviolet (UV) radiation) Alert Headlines (e.g tornadoes, earthquakes, and floods) and Details. Almanac Information.

THE HISTORY

- There are several reasons why weather forecasts are important. They would certainly be missed if they were not there.
- It is a product of science that impacts the lives of many people. The following is a list of various reasons why weather forecasts

LIMITATIONS

- Weather is extremely difficult to forecast correctly.
- It is expensive to monitor-so many variables from so many source
- The computers needed to perform the millions of calculations necessary are expensive
- The weather forecasters get blamed if the weather is different from the forecast

APPROACH

- User will enter current temperature, humidity and wind, System will take this parameter and will predict weather(rainfall in inches) from previous data in database(dataset)
- The role of the admin is to add previous weather data in database, so that system will calculate weather(estimated rainfall in inches) based on these data.
- Weather forecasting system takes parameters such as temperature, humidity, and wind and will forecast weather based on previous record therefore this prediction will prove reliable. This system can be used in Air Traffic, Marine, Agriculture, Forestry, Military, and Navy etc

BENEFITS

- This project presents a design of a weather monitoring system. It stores data collected at some predetermined sampling interval, with date and time stamps for later retrieval with real-time notifications for supervision and analysis of different environmental parameters like temperature, humidity, atmospheric pressure, wind speed, wind direction, air quality, light intensity, amount of rainfall and coordinates of the location.
- Weather forecasting uses tools, observational data, science, and technology to predict the weather hours, days, and months in advance for a given location

- Observational data collected by doppler radar, radiosondes, weather satellites, buoys and other instruments are fed into computerized NWS numerical forecast models. The models use equations, along with new and past weather data, to provide forecast guidance to our meteorologists.

RESULT:

Thus, the project team formed, the project is described, the business case was prepared and the problem statement arrived.



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Course Code: 18CSC206J

Course Name: Software Engineering and Project Management

Experiment No	2
Title of Experiment	Identification of Process Methodology and Stakeholder Description
Name of the candidate	SARAGADAM VAMSI VARSHITH
Team Members	KOTIKALAPUDI TULASI VENKATA BHADRA GANESH
Register Number	RA2111003011782
Date of Experiment	

Mark Split Up

S.No	Description	Maximum Mark	Mark Obtained
1	Exercise	5	5
2	Viva	5	5
Total		10	10

Staff Signature with date

Aim

To identify the appropriate Process Model for the project and prepare Stakeholder and User Description.

Team Members:

No	Register No	Name	Role
	RA2111003011782	SARAGADAM VAMSI VARSHITH	Member
	RA2111003011769	KOTIKALAPUDI TULASI VENKATA BHADRA GANESH	Member

Project Title:

Selection of Methodology : Prototype Model

- Begins with communication
- A quick plan for prototyping and modeling occur.
- Quick design focuses on the representation of those aspects the software will be visible to end users. (Interface and output).
- Design leads to the construction of a prototype which will be deployed and evaluated.
- Stakeholder's comments will be used to refine requirements.

Prototyping – When to Select

1. Customer defines a set of general objectives
2. Does not identify detailed requirements
3. Developer may be unsure of the efficiency of an algorithm, the form that human computer interaction should take.
4. When your customer has a legitimate need, but is clueless about the details, develop a prototype as a first step.

Prototyping - Advantages

1. Provides working model.
2. Customer is highly satisfied with such a modeling at initial stages
3. Developer gains business insight, reducing ambiguity
4. Great involvement of users
5. Reduce risks

Incorporate information to below table regarding stakeholders of the project [Make use of below examples]

Stakeholder Name	Activity/ Area /Phase	Interest	Influence	Priority (High/ Medium/ Low)
Owner	Increase sales & marketing	High	High	High
Project Manager	End Product	High	Low	Medium
Investors	Finance	Low	High	Medium
Members	End product	High	High	High

Stakeholder	Interests	Estimated Project Impact	Estimated Priority
Owner	Achieve targets, Increase sales margin	High	1
Sponsor	Provides new market to expand ventures Negotiate funding for project Reviews changes to project environments.	Med	3
Team members	Demand incentives Retain and upgrade skills New product excitement	High	2
Project Manager	Lead the team in every aspect. Accountable for entire project scope, team, success & failure.	High	2
Investors	Promoter of the investment. Provides necessary financial resources	Low	5
Resource Manager	Resource planning and allocation. Ensuring adequate resource according to project needs and budget.	Med	4
Suppliers	Ensuring feasible and realistic in every aspect Managing divergence from budgeted cost.	Med	6
End Users	Provides feedback	Low	7

Result

Thus the Project Methodology was identified and the stakeholders were described.



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Course Code: 18CSC206J

Course Name: Software Engineering and Project Management

Experiment No	3
Title of Experiment	System, Functional and Non-Functional Requirements of the Project
Name of the candidate	SARAGADAM VAMSI VARSHIT VARSHITH
Team Members	KOTIKALAPUDI TULASI VENKATA BHADRA GANESH
Register Number	RA2111003011782
Date of Experiment	03/02/2023

Mark Split Up

S.No	Description	Maximum Mark	Mark Obtained
1	Exercise	5	5
2	Viva	5	5
Total		10	10

Staff Signature with date

H. R. M
10/2/23

Aim :

To identify the system, functional and non-functional requirements for the project.

Team Members:

S No	Register No	Name	Role
1	RA2111003011782	SARAGADAM VAMSI VARSHIT VARSHITH	Rep/Member
2	RA2111003011769	KOTIKALAPUDI TULASI VENKATA BHADRA GANESH	Member

Project Title: WEATHER FORECASTING SYSTEM

System Requirements

The following are some of the basic system requirements for a weather forecasting system project:

1. **Hardware:** A system with a high-performance processor and enough RAM to support data processing and storage.
2. **Operating System:** A modern operating system such as Windows, Linux or macOS is required.
3. **Database:** A database management system (DBMS) is required for storing large amounts of weather data.
4. **Programming Language:** A high-level programming language such as Python, R or Java for developing the forecasting algorithms and visualizing the results.
5. **Web Server:** A web server such as Apache or Nginx to host the weather forecasting system and serve the results to users via a web interface.
6. **Data Sources:** Access to reliable weather data sources, such as National Oceanic and Atmospheric Administration (NOAA) or European Centre for Medium-Range Weather Forecasts (ECMWF), is necessary for the accurate forecast.
7. **User Interface:** A user-friendly interface for entering and viewing the weather data and forecasts.

Functional Requirements

Functional requirements are the specific functions and features that the weather forecasting system should perform. Some of the functional requirements for a weather forecasting system project are:

1. Data Collection: The system should be able to collect weather data from reliable sources in real-time or near real-time.
2. Data Processing: The system should be able to process the collected data to generate weather forecasts.
3. Forecast Generation: The system should generate short-term and long-term weather forecasts for different geographic locations.
4. Data Visualization: The system should provide visual representation of the weather forecasts and historical data.
5. User Management: The system should provide different levels of access to the users based on their roles and responsibilities.
6. Alerts and Notifications: The system should be able to send alerts and notifications to the users in case of severe weather conditions.
7. Mobile Accessibility: The system should be accessible from mobile devices for the users to access the forecasts on-the-go.
8. Historical Data: The system should provide access to historical weather data for analysis and comparison.
9. Integration with Other Systems: The system should be able to integrate with other systems, such as emergency management systems, to provide accurate and timely information in emergency situations.

Non-Functional Requirements

Non-functional requirements are the performance, security, and usability characteristics that a weather forecasting system must meet. Some of the non-functional requirements for a weather forecasting system project are:

1. Performance: The system should respond quickly to user requests and process the data in a timely manner.
2. Scalability: The system should be able to handle increasing amounts of data and users as the demand grows.
3. Reliability: The system should be highly available and function correctly even in case of failures or errors.
4. Security: The system should protect the data and user information from unauthorized access and tampering.
5. Usability: The system should have an intuitive and user-friendly interface for

users to access and interact with the data and forecasts.

6. Compatibility: The system should be compatible with different operating systems, web browsers, and devices.
7. Maintainability: The system should be easy to maintain and upgrade to accommodate future changes and improvements.
8. Compliance: The system should comply with relevant regulations and standards, such as privacy and data protection laws.

Result

Thus the requirements were identified and accordingly described.



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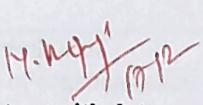
Course Code: 18CSC206J

Course Name: Software Engineering and Project Management

Experiment No	4
Title of Experiment	Prepare Project Plan based on scope, Calculate Project effort based on resources and Job roles and responsibilities
Name of the candidate	SARAGADAM VAMSI VARSHITH
Team Members	KOTIKALAPUDI TULASI VENKATA BHADRA GANESH
Register Number	RA2111003011782
Date of Experiment	

Mark Split Up

S.No	Description	Maximum Mark	Mark Obtained
1	Exercise	5	5
2	Viva	5	5
Total		10	10


Staff Signature with date

Aim

To Prepare Project Plan based on scope, Calculate Project effort based on resources,
Find Job roles and responsibilities

Team Members:

Sl No	Register No	Name	Role
1	RA2111003011782	SARAGADAM VAMSI VARSHITH	Lead
2	RA2111003011769	KOTIKALAPUDI TULASI VENKATA BHADRA GANESH	Member

1. Project Management Plan

FOCUS AREA	DETAILS
Scope Management	Scope statement Requirements (information, working of the software, database management, constraints/stakeholders) Task allocation
Schedule Management	Provision of forecasting accurately and on time
Cost management	Budget management Efficient effort calculation Minimizing the cost increasing factors
Resource management	Finance: budget requirement Technology: proper setup with internet access Skills: ability to code/access the site
Stakeholder	Identifying, Analyzing & Engaging Stakeholders
Communication Management	Communication with the user – method of communication and the medium of communication
Risk Management	Identification of risk factors Analyzing proper ideologies to overcome the risk threats Prioritizing and eradication of risk causing factors

ESTIMATION:**EFFORT AND COST ESTIMATION**

Activity Description	Sub-Task	Sub-Task Description	Effort (in hours)	Cost in INR
	E1R1A1T1	Display the user privacy policy KLOC=0.5	0.23	196
	E1R1A1T2 Home screen	The website prompts to the home screen which asks the user for user to choose location KLOC=0.5	1.38	1173
	E1R1A1T3 Main Page	The main page provides with variety of options i.e past weather updates. KLOC=1	3	2550

database Management	E1R1A2T1 Backend	It stores and arranges data, and also makes sure everything on the client-side of the website works fine KLOC=4	18	15300
Effort (hr) Cost (INR)				
1 850				

Basic COCOMO (semi-detached)

It is semi-detached as the team size is comparatively small with 3 people, coding knowledge is required and complexity of development is a little high compared to organic

Software Projects	a	b	c	d
Organic	2.4	1.05	2.5	0.38
Semi Detached	3.0	1.12	2.5	0.35
Embedded	3.6	1.20	2.5	0.32

FORMULAS:

$$\text{Effort } E = a (\text{KLOC})^b$$

$$\text{Time} = c (\text{Effort})^d$$

$$\text{Person required} = \text{Effort} / \text{time}$$

$$\text{Staff size} = 2$$

1. for E1R1A1T1, KLOC = 0.5,

$$\text{Effort } E = 3 (0.5)^{1.12}$$

$$= 0.23$$

2. E1R1A1T2, KLOC = 0.5

$$\text{Effort } E = 3(0.5)^{1.12} = 1.38$$

4. E1R1A1T3, KLOC=1

$$\text{Effort } E=3(1)^{1.12}=3$$

5.E1R1A2T1, KLOC=5

$$\text{Effort } E=3(5)^{1.12}=18$$

Infrastructure/Resource Cost [CapEx]

Infrastructure Requirement	Qty	Cost per qty	Cost per item
HIGH LEVEL PC,S	3	50,000	1,50,000
SENSORS ,RADAR SYSTEM	3	20,000	60,000

Maintenance and Support Cost [OpExq]

Category	Details	Qty	Cost per qty per annum	Cost per item
infrastructure		1	96000	96000
License	Operating System Database Middleware IDE	1	30000	30000

Project Team Formation

1.1. Identification Team members

Name	Role	Responsibilities
VARSHITH	Key Business User (Product Owner)	Provide clear business and user requirements
	Project Manager	Manage the working and functioning of the project
	Frontend Developer	Develops the user interface
GANESH	Technical Lead	Design the end-to-end architecture of the website
	UX Designer	Design the user experience
	Cloud Architect	Design the cost effective, highly available and scalable architecture
GANESH	Business Analyst	Regulates the Documentation Requirements
	Tester	Define Test Cases and Perform Testing
	Backend Developer	Design & Development

1.1. Responsibility Assignment Matrix

RACI Matrix		Team Members		
Activity	Name (BA)-	Name- DEVELOPER	Name (Project Manager) -	Key Business User
User Requirement Documentation	A	C/I	I	R
Website designing	I	A	R	
Data integration & security	C	A/R	A/R	
Database management	R	I/A	R	

A	Accountable
R	Responsible
C	Consult
I	Inform

Result: Thus, the Project Plan was documented successfully



School of Computing

SRM IST, Kattankulathur – 603 203

Course Code: 18CSC206J

Course Name: Software Engineering and Project Management

Experiment No	5
Title of Experiment	Prepare Work breakdown structure, Timeline chart, Risk identification table
Name of the candidate	SARAGADAM VAMSI VARSHITH
Team Members	KOTIKALAPUDI TULASI VENKATA BHADRA GANESH
Register Number	RA2111003011782
Date of Experiment	

Mark Split Up

S.No	Description	Maximum Mark	Mark Obtained
1	Exercise	5	4
2	Viva	5	4
	Total	10	8

H. Ray 12/3

Staff Signature with date

Aim

To Prepare Work breakdown structure, Timeline chart and Risk identification table

Team Members:

SI No	Register No	Name	Role
1	RA2111003011782	SARAGADAM VAMSI VARSHITH	Rep
2	RA2111003011769	KOTIKALAPUDI TULASI VENKATA BHADRA GANESH	Member

WORK BREAKDOWN STRUCTURE(WBS)

1. Planning phase:

- a. Project initiation
- b. Stakeholder identification and analysis
- c. Requirements gathering and analysis
- d. Design and development of the system architecture
- e. Budgeting and resource allocation

2. System Development phase:

- a. Selection of hardware and software components
- b. System integration
- c. Data gathering and analysis
- d. Algorithm development
- e. Quality assurance and testing

3. Deployment phase:

- a. Installation and configuration of the system
- b. Training and support
- c. Post-deployment monitoring and evaluation
- d. Maintenance and upgrades

TIMELINE CHART:

TASK	DURATION (WEEKS)	START DATE	END DATE
Planning phase	2		
Software Development	4		

Deployment phase	2		
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RISK IDENTIFICATION TAABLE

Risk	Likelihood	Impact	Mitigation Strategy
Accuracy:	high	high	1.not a perfect science 2.errors in the data 3.unexpected changes
False sense of security	medium	medium	1.Relying too heavily on weather forecasts 2.Risk can be mitigated.
Economic impacts	high	medium	1.agriculture, transportation, and tourism get affected
Communication	high	high	1.Effective communication 2.risks associated
Limited lead time	low	high	1.provide valuable information 2.prepare for severe weather 3.take action quickly.

SWOT Analysis

SWOT analysis stands for Strengths, Weaknesses, Opportunities, and Threats. This technique is used to analyze both internal and external factors that may affect the project.

Strengths:

1.High demand for traffic monitoring system in urban areas 2.Experienced team with knowledge of traffic monitoring systems 3.Availability of relevant technology and hardware

Weaknesses:

High cost of implementation and maintenance Complex technical requirements Potential for hardware and software failure

Opportunities:

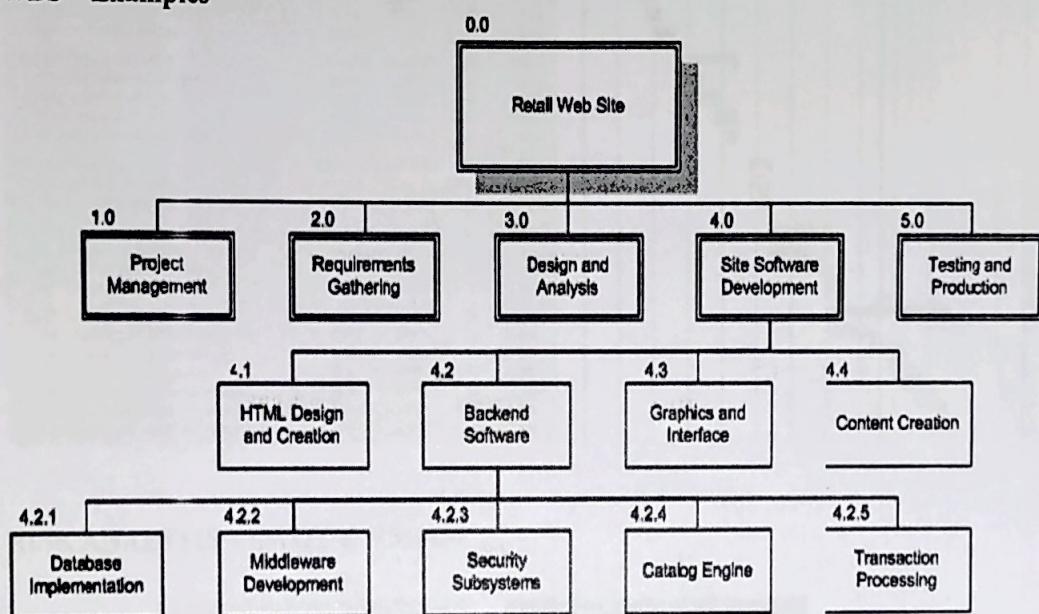
Potential for future expansion of the system Possibility of selling the system to other municipalities or organizations Integration with other smart city technologies

Threats:

Competition from other traffic monitoring solutions Risk of system being hacked or compromised Changes in regulations or funding that may affect the project

Result: Thus, the work breakdown structure with timeline chart and risk table were formulated successfully.

WBS – Examples

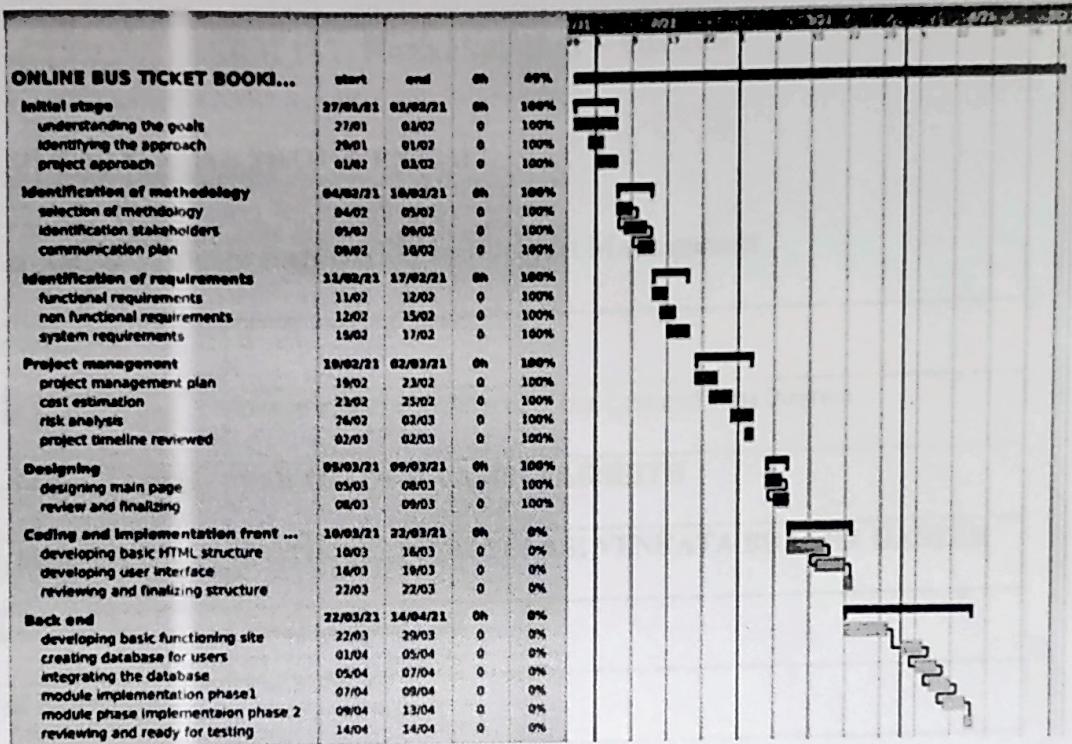


- 0.0 Retail Web Site
- 1.0 Project Management
- 2.0 Requirements Gathering
- 3.0 Analysis & Design
- 4.0 Site Software Development
 - 4.1 HTML Design and Creation
 - 4.2 Backend Software
 - 4.2.1 Database Implementation
 - 4.2.2 Middleware Development
 - 4.2.3 Security Subsystems
 - 4.2.4 Catalog Engine
 - 4.2.5 Transaction Processing

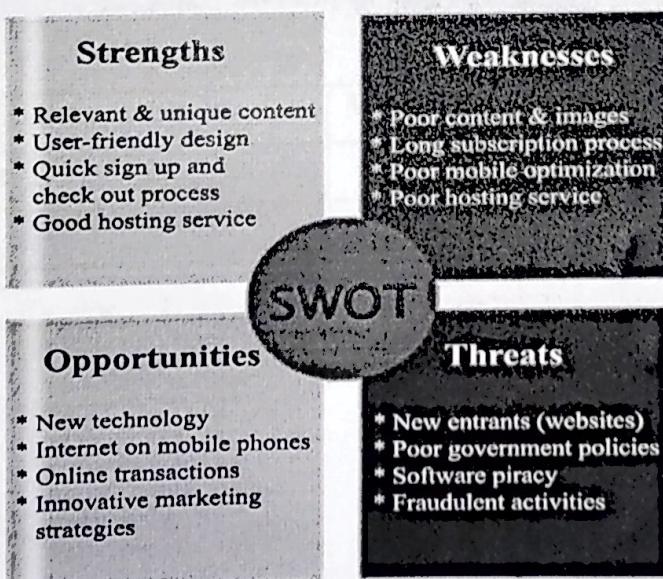
- 4.3 Graphics and Interface
- 4.4 Content Creation

□ 5.0 Testing and Production

TIMELINE – GANTT CHART



RISK ANALYSIS – SWOT & RMMM





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Course Code: 18CSC206J

Course Name: Software Engineering and Project Management

Experiment No	6
Title of Experiment	Design a System Architecture, Use Case and Class Diagram
Name of the candidate	SARAGADAM VAMSI VARSHITH
Team Members	KOTIKALAPUDU TULASI VENKATA BHADRA GANESH
Register Number	RA2111003011782
Date of Experiment	

Mark Split Up

S.No	Description	Maximum Mark	Mark Obtained
1	Exercise	5	5
2	Viva	5	5
	Total	10	10

M-24/T3/0

Staff Signature with date

Team Members:

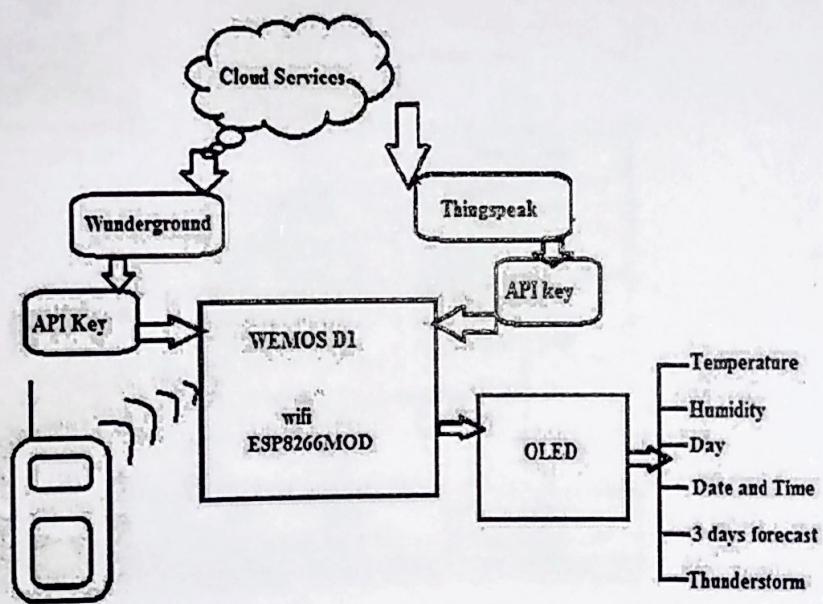
Sl No	Register No	Name	Role
1	RA2111003011782	SARAGADAM VAMSI VARSHITH	Rep
2	RA2111003011769	KOTIKALAPUDI TULASI VENKATA BHADRA GANESH	Member

Requirements

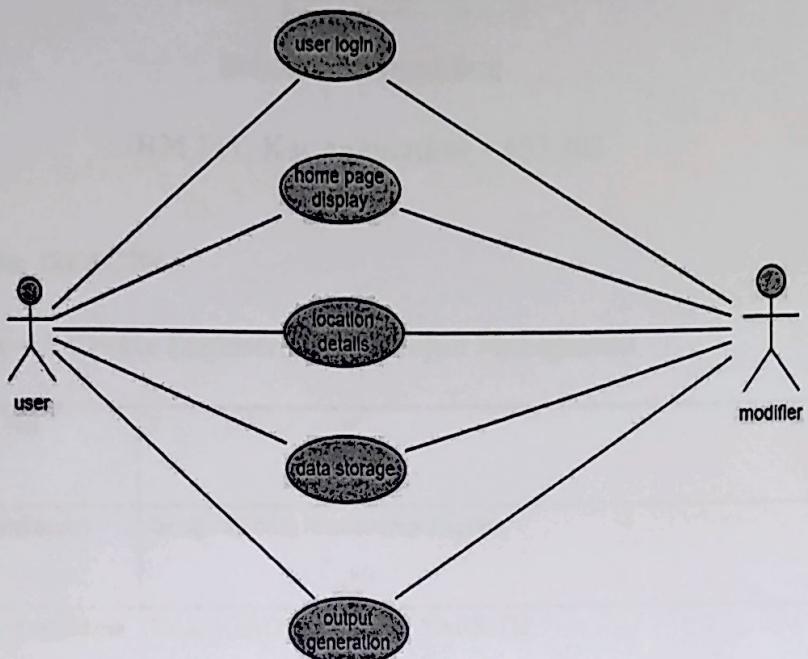
<System Architecture, Use Case and Class Diagram>

Result:

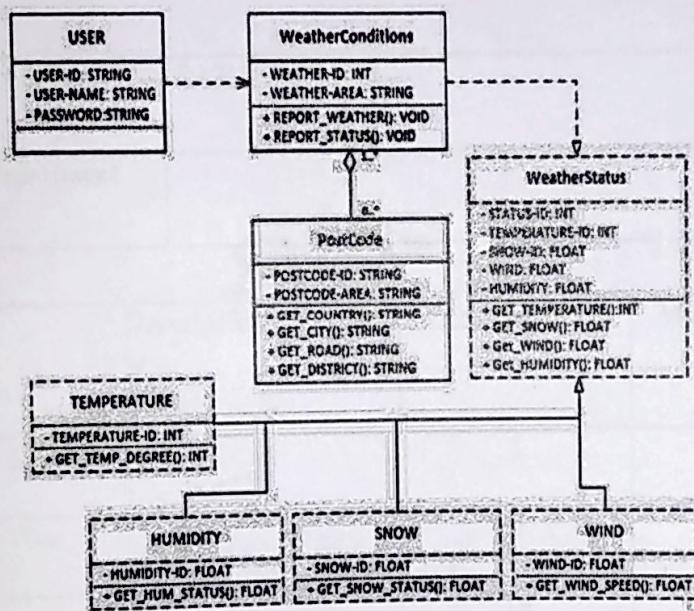
Thus, the system architecture, use case and class diagram created successfully.

SYSTEM ARCHITECTURE – Example

USE CASE DIAGRAM – Example



CLASS DIAGRAM – Example



result: Architecture and UseCase and Class Diagram
Created Successfully



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Course Code: 18CSC206J

Course Name: Software Engineering and Project Management

Experiment No	7
Title of Experiment	Design a Entity relationship diagram
Name of the candidate	SARAGADAM VAMSI VARSITH
Team Members	KOTIKALAPUDI TULASI VENKATA BHADRA GANESH
Register Number	RA2111003011782
Date of Experiment	

Mark Split UP

S. No	Description	Maximum Mark	Mark Obtained
1	Exercise	5	5
2	Viva	5	5
Total		10	10

Signature of Staff with date

4-24-2013

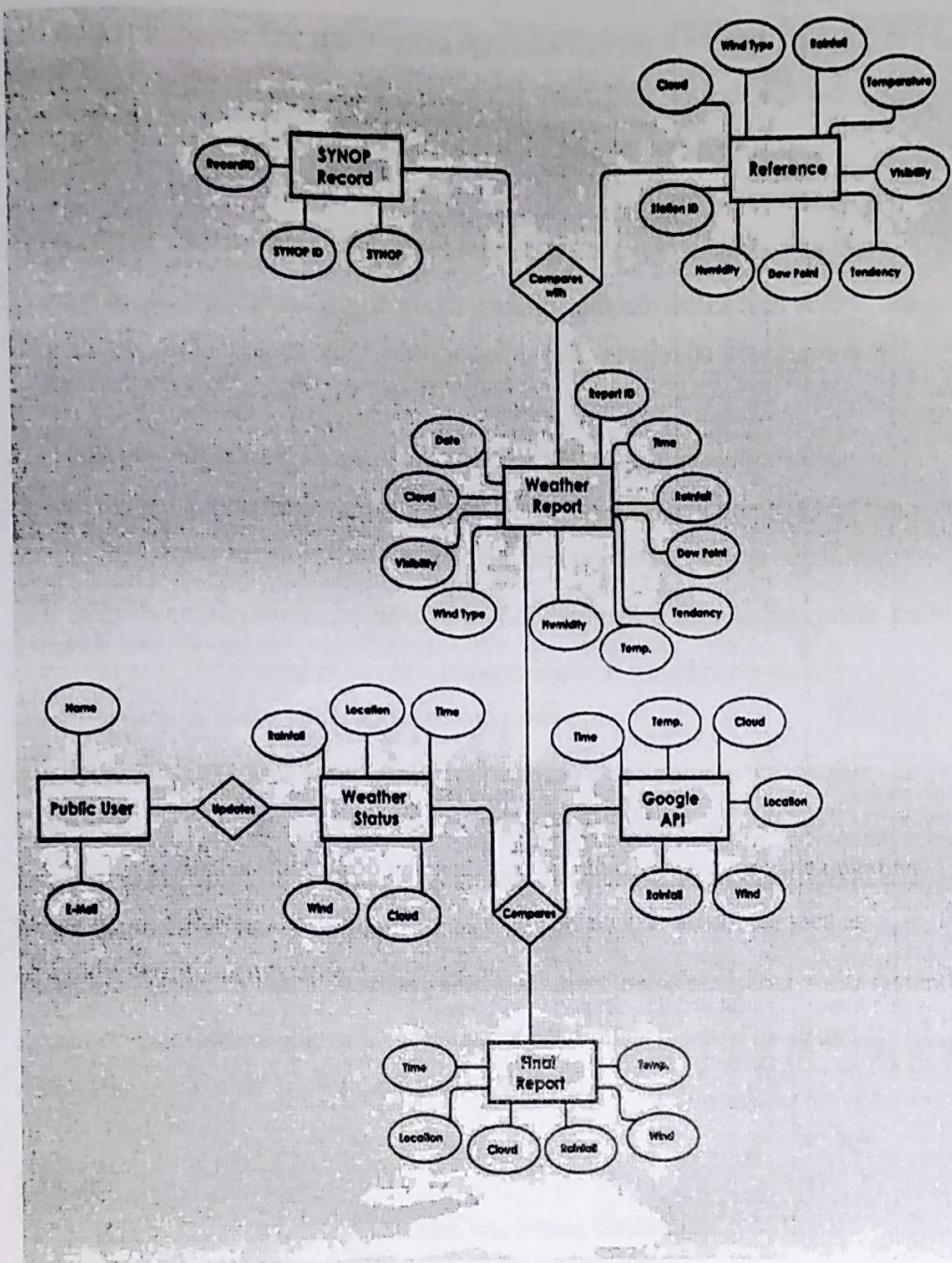
Aim

To create the Entity Relationship Diagram

Team Members:

S No	Register No	Name	Role
1	RA2111003011782	S. VAMSI VARSHITH	Rep
2	RA2111003011769	K.GANESH	Member

ENTITY RELATIONSHIP DIAGRAM FOR WEATHER FORECASTING SYSTEM:



Entities in er diagram of weather forecasting system :

The entities in an ER diagram for a weather forecasting system might include:

- 1) **Location**: This entity would represent a geographic location for which weather data is being collected and analyzed. It would likely include attributes such as latitude, longitude, and name.

2) **Weather Station:** This entity would represent a physical weather station that collects weather data at a particular location. It would likely include attributes such as station ID, location, and type of equipment.

3) **Weather Data:** This entity would represent the actual weather data that is collected by the weather station. It would likely include attributes such as temperature, pressure, humidity, wind speed and direction, and precipitation.

4) **Weather Forecast:** This entity would represent the predicted weather conditions for a particular location at a particular time in the future. It would likely include attributes such as date/time, location, and predicted weather conditions.

5) **User:** This entity would represent a user of the weather forecasting system, such as a member of the general public or a meteorologist. It would likely include attributes such as name, email address, and password.

6) **Subscription:** This entity would represent a subscription to the weather forecasting system, allowing a user to receive regular updates on weather conditions for a particular location. It would likely include attributes such as subscription ID, location, and duration.

7) **Alert:** This entity would represent a weather alert that is generated by the system for a particular location due to severe weather conditions. It would likely include attributes such as alert ID, location, and type of alert.

Result:

Thus, the entity relationship diagram was created successfully.

*/ ER Diagram, Notation and Example

What is ER Diagram?

- ER Diagram stands for Entity Relationship Diagram, also known as ERD is a diagram that displays the relationship of entity sets stored in a database. In other words, ER diagrams help to explain the logical structure of databases. ER diagrams are created based on three basic concepts: entities, attributes and relationships.

- ER Diagrams contain different symbols that use rectangles to represent entities, ovals to define attributes and diamond shapes to represent relationships.

- At first look, an ER diagram looks very similar to the flowchart. However, ER Diagram includes many specialized symbols, and its meanings make this model unique. The purpose of ER Diagram is to represent the entity framework infrastructure.

What is ER Model?

- ER Model stands for Entity Relationship Model is a high-level conceptual data model diagram. ER model helps to systematically analyze data requirements to produce a well-designed database.
- ER Model represents real-world entities and the relationships between them. Creating an ER Model in DBMS is considered as a best practice before implementing your database.
- ER Modeling helps you to analyze data requirements systematically to produce a well-designed database. So, it is considered a best practice to complete ER modeling before implementing your database.

Why use ER Diagrams?

Here, are prime reasons for using the ER Diagram

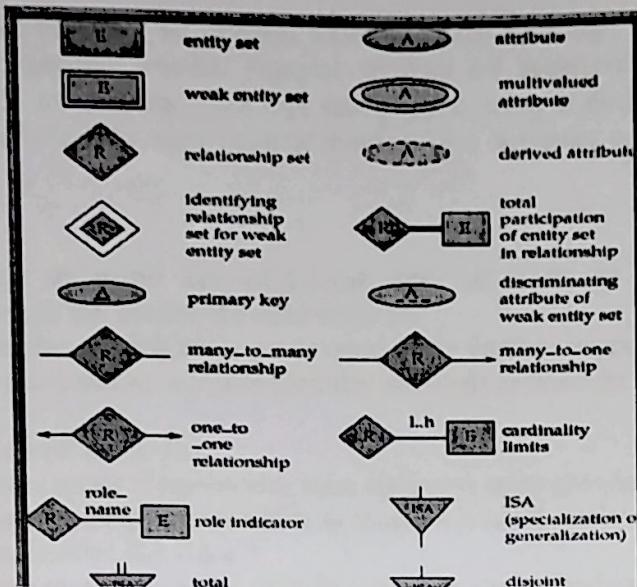
- Helps you to define terms related to entity relationship modeling
- Provide a preview of how all your tables should connect, what fields are going to be on each table
- Helps to describe entities, attributes, relationships
- ER diagrams are translatable into relational tables which allows you to build databases quickly
- ER diagrams can be used by database designers as a blueprint for implementing data in specific software applications
- The database designer gains a better understanding of the information to be contained in the database with the help of ERP diagram
- ERD Diagram allows you to communicate with the logical structure of the database to users

Components of the ER Diagram

This model is based on three basic concepts: Entities, Attributes, Relationships

ER Diagram – Notations

- Rectangles represent entity sets.
- Diamonds represent relationship sets.
- Lines link attributes to entity sets and entity sets to relationship sets.
- Ellipses represent attributes
- Double ellipses represent multivalued attributes.
- Dashed ellipses denote derived attributes.
- Underline indicates primary key attributes



ADDITIONAL NOTES

- A database can be modeled as a collection of entities, relationship among entities.

- An entity is an object that exists and is distinguishable from other objects.

Example: specific person, company, event, plant

- Entities have attributes.

Example: people have names and addresses

- An entity set is a set of entities of the same type that share the same properties.

Example: set of all persons, companies, trees, holidays

- Express the number of entities to which another entity can be associated via a relationship set

Cardinality

- For a binary relationship set the mapping cardinality must be one of the following types:

1. One to one

A customer is associated with at most one loan via the relationship borrower. A loan is associated with at most one customer via borrower

2. One to many

A loan is associated with at most one customer via borrower, a customer is associated with several (including 0) loans via borrower

3. Many to one

A loan is associated with several (including 0) customers via borrower, a customer is associated with at most one loan via borrower

4. Many to many

A loan is associated with several (including 0) customers via borrower, a customer is associated with several loans (including 0) via borrower

Weak Entity Set

- An entity set that does not have a primary key is referred to as a weak entity set and represented by double outlined box in E-R diagram.

Example : Consider the entity set payment which got three attributes : payment_number, payment_date and payment_amount. Payment numbers are sequential starting from 1 generally separately for each loan. Although each payment entity is distinct, payments for different loans may share the same payment number. Thus this entity set does not have a primary key.

Discriminator

- The discriminator (or partial key) of a weak entity set is the set of attributes that distinguishes among all the entities of a weak entity set

Example: discriminator of weak entity set payment is the attribute payment_number since for each loan a payment number uniquely identifies one single payment for that loan.

Specialization-Generalization-ISA

- E-R model provides means of representing these distinctive entity groupings
- Process of designating subgroupings within an entity set is called specialization depicted by triangle component labelled ISA ("is a")
- Bottom up design process in which multiple entity sets are synthesized into higher level entity set - Generalization
- ISA relationship may also be referred to as superclass-subclass relationship
- Higher and lower level entity sets are designated by the terms superclass and subclass.
- Specialization and generalization are simple inversions of each other; they are represented in an E-R diagram in the same way.

Total & Partial Participation

- Total participation (indicated by double line): every entity in the entity set participates in at least one relationship in the relationship set

E.g. participation of loan in borrower is total, every loan must have a customer associated to it via borrower

- Partial participation: some entities may not participate in any relationship in the relationship set

Example: participation of customer in borrower is partial

Cardinality limits

- Cardinality limits can also express participation constraints
- Minimum and maximum cardinality is expressed as l..h where l is the minimum and h is the maximum cardinality
- Minimum value of 1 indicates total participation of entity set in relationship set
- Maximum value of 1 indicates entity participates in atmost one relationship set.
- Maximum value of * indicates no limit

Role indicator

- Entity sets of a relationship need not be distinct
- The labels "manager" and "worker" are called roles; they specify how employee entities interact via the works-for relationship set.

Disjoint Generalization

- Role labels are optional, and are used to clarify semantics of the relationship
- Disjointness constraint requires that an entity belong to more than one lower level entity set.



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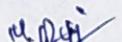
Course Code: 18CSC206J

Course Name: Software Engineering and Project Management

Experiment No	8
Title of Experiment	Develop a Data Flow Diagram (Process-Up to Level 1)
Name of the candidate	SARAGADAM - VAMSI VARSHITH
Team Members	K.GANESH S.VARSHITH
Register Number	RA2111003011782
Date of Experiment	

Mark Split Up

S. No	Description	Maximum Mark	Mark Obtained
1	Exercise	5	5
2	Viva	5	5
	Total	10	10


Staff Signature with date

Aim

To develop the data flow diagram up to level 1 for the <project name>

Team Members:

S No	Register No	Name	Role
1	RA2111003011782	S. VAMSI VARSHITH	Rep
2	RA2111003011769	K. GANESH	Member

Data Flow Diagram

The DFD takes an input-process-output view of a system. That is, data objects flow into the software, are transformed by processing elements, and resultant data objects flow out of the software. Data objects are represented by labeled arrows, and transformations are represented by circles (also called bubbles). The DFD is presented in a hierarchical fashion. That is, the first data flow model (sometimes called a level 0 DFD or context diagram) represents the system as a whole. Subsequent data flow diagrams refine the context diagram, providing increasing detail with each subsequent level.

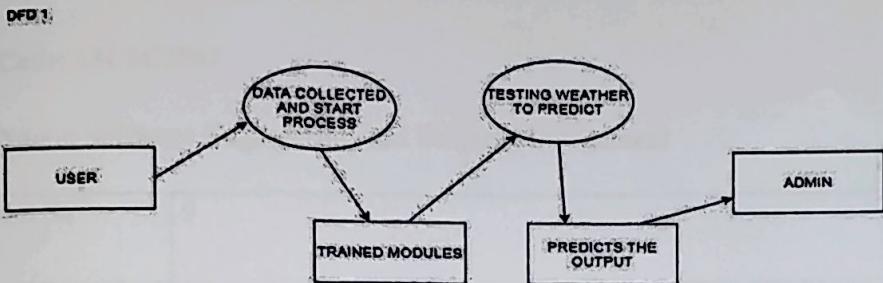
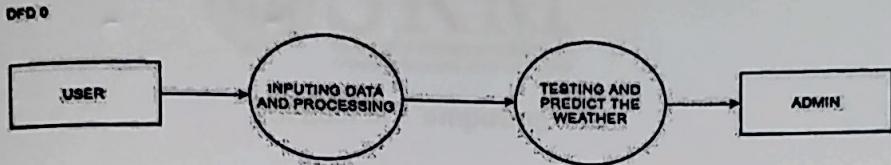
The data flow diagram enables you to develop models of the information domain and functional domain. As the DFD is refined into greater levels of detail, you perform an implicit functional decomposition of the system. At the same time, the DFD refinement results in a corresponding refinement of data as it moves through the processes that embody the application.

A few simple guidelines can aid immeasurably during the derivation of a data flow diagram:

- (1) Level 0 data flow diagram should depict the software/system as a single bubble;
- (2) Primary input and output should be carefully noted;
- (3) Refinement should begin by isolating candidate processes, data objects, and data stores to be represented at the next level;
- (4) All arrows and bubbles should be labeled with meaningful names;
- (5) Information flow continuity must be maintained from level to level and
- (6) One bubble at a time should be refined. There is a natural tendency to overcomplicate the data flow diagram. This occurs when you attempt to show too much detail too early or represent procedural aspects of the software in lieu of information flow.

DATA FLOW DIAGRAM FOR WEATHER FORECASTING SYSTEM:

Data Flow Diagram (DFD) for a Weather Forecasting System up to Level 1:



Level 0:

- The external entities are the weather data sources, such as weather sensors, satellite imagery, and weather stations.
- The process is the Weather Forecasting System, which receives data from the weather data sources and processes it to generate weather forecasts.
- The data stores are the historical weather data, forecast models, and the weather forecast database.

Level 1:

- The Weather Forecasting System is decomposed into three main processes: Data Collection, Forecast Generation, and Forecast Distribution.
- The Data Collection process receives weather data from the weather data sources and stores it in the historical weather data store.
- The Forecast Generation process takes the historical weather data and runs it through the forecast models to generate the weather forecasts, which are then stored in the weather forecast database.
- The Forecast Distribution process takes the weather forecasts from the weather forecast database and distributes them to the external entities, such as weather websites, mobile applications, and TV news channels.

Result: Thus, the data flow diagrams have been created for the <project name>.



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Course Code: 18CSC206J

Course Name: Software Engineering and Project Management

Experiment No	9
Title of Experiment	Design a Sequence and Collaboration Diagram
Name of the candidate	SARAGADAM VAMSI VARSHITH
Team Members	KOTIKALAPUDI TULASI VENKATA BHADRA GANESH
Register Number	RA2111003011782
Date of Experiment	

Mark Split Up

S. No	Description	Maximum Mark	Mark Obtained
1	Exercise	5	5
2	Viva	5	5
	Total	10	10

M. D. J.
Staff Signature with date

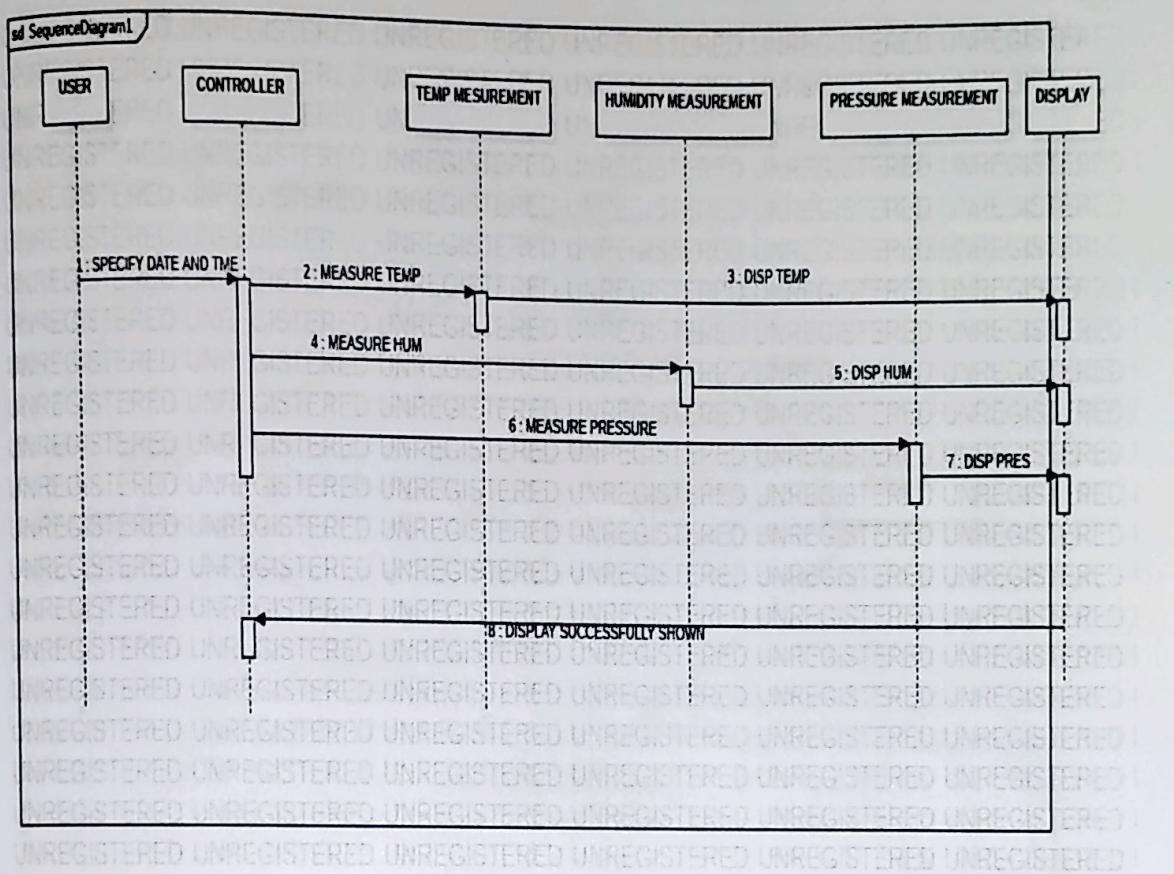
Aim

To create the sequence and collaboration diagram for the <project name>

Team Members:

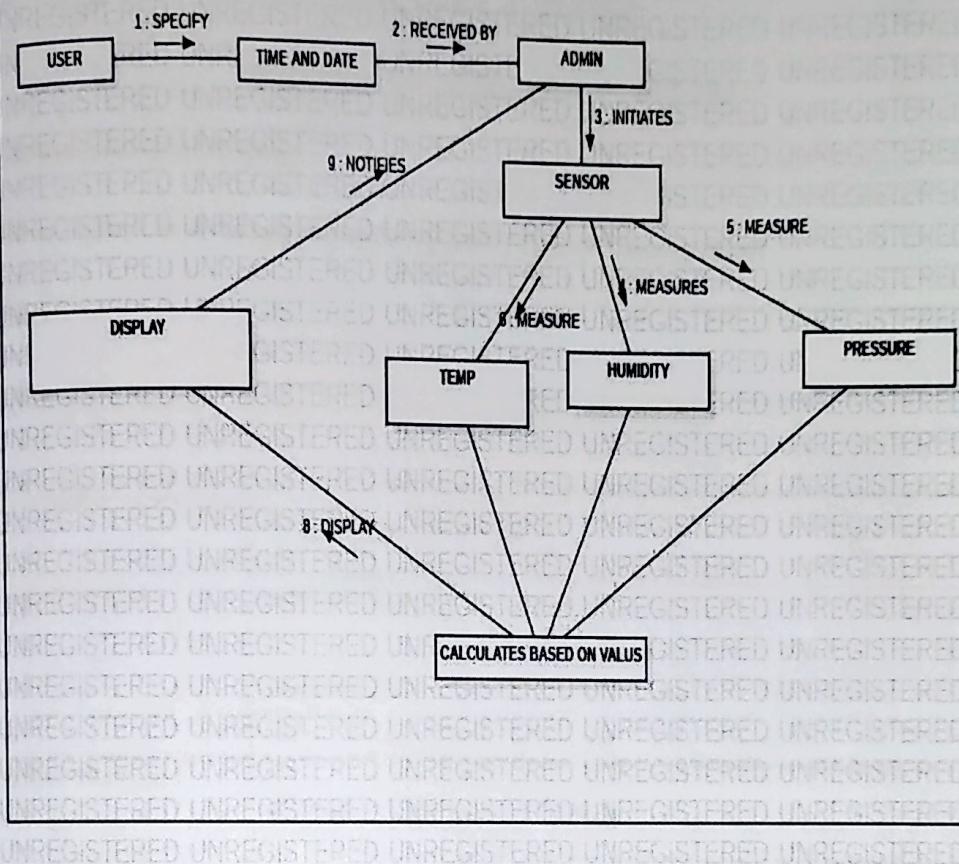
S No	Register No	Name	Role
1	RA2111003011782	SARAGADAM VAMSI VARSHITH	Rep/Member
2	RA2111003011769	KOTIKALAPUDI TULASI VENKATA BHADRA GANESH	Member

Sequence Diagram



Collaboration Diagram:

sd CommunicationDiagram1



Result:

Thus, the sequence and collaboration diagrams were created for the weather forecasting system.



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Course Code: 18CSC206J

Course Name: Software Engineering and Project Management

Experiment No	10
Title of Experiment	Develop a Testing Framework/User Interface
Name of the candidate	S.Varshith
Team Members	K.GANESH S.VARSHITH
Register Number	RA2111003D11782
Date of Experiment	

Mark Split Up

S. No	Description	Maximum Mark	Mark Obtained
1	Exercise	5	5
2	Viva	5	5
Total		10	10

Staff Signature with date

Aim

To develop the testing framework and/or user interface framework for the <project name>

Team Members:

S No	Register No	Name	Role
1			Rep/Member

AIM:

To develop the testing framework and/or user interface framework for the weather forecasting system

scope:

The scope of a weather forecasting system is to predict future weather conditions by analyzing past and current weather data using mathematical models and algorithms. The system may also use various sensors and instruments to collect data from the atmosphere, such as temperature, humidity, wind speed and direction, atmospheric pressure, and precipitation.

Approach to test the software application:

It is very important to test the application before its launch. Testing is very important to give user good experience which

leads in gaining more loyal customers for the software or application. Testing plays an

It is very important to test the software making the product successful.

We will be testing the software on mainly two approaches:-

1. functional testing approach

2. Non - functional testing approach

Executive Summary

We are developing a testing framework and user interface for a weather forecasting system. The goal is to ensure that the system meets the requirements and performs as expected. The testing framework will include automated testing, manual testing, and regression testing, while the user interface will allow users to interact with the system and view the results. We will use tools such as Selenium, JUnit, TestNG, Python, D3.js, React, and Node.js to develop the testing framework and user interface.

Test Plan:

Scope of Testing:

- Functional testing: To ensure that the system meets the functional requirements, such as data input, processing, and output.
- Performance testing: To measure the system's response time, throughput, and resource utilization under different load conditions.
- Usability testing: To evaluate the user interface's ease of use, learnability, and effectiveness in achieving the user's goals.
- Security testing: To identify and mitigate security vulnerabilities that can compromise the system's confidentiality, integrity, and availability.

Types of Testing:

- Automated testing: To reduce the time and effort required for testing and increase the test coverage. We will use tools such as Selenium, JUnit, and TestNG for automated testing.
- Manual testing: To evaluate the system's usability and performance from a user's perspective. We will use human testers to perform manual testing.
- Regression testing: To ensure that the changes made to the system do not introduce new bugs or regressions. We will use TestNG for regression testing.

Functional:

FUNCTIONAL TESTING is a type of software testing that validates the software system against the functional re

TEST ITEM	DESCRIPTION
Use interface testing	The testing of this particular module code will consist of checking if the application displays all the required buttons and check if the settings panel is in the main screen. The border line case of this module would be to check how the UI responds when the keyboard or the touch screen doesn't work or the user provides or gives too many stimuli to the software.
Platform Testing	We ensure that your E-learning domains are flawless and readily accessible, irrespective of the operating software, mobile device browser used. We make sure the application works conveniently across all platforms.
Database testing	The purpose of database testing is to verify that the data is valid, reliable, and secure, and that the database management system (DBMS) is functioning correctly.
Content validation	Content validation is a type of database testing that focuses on ensuring that the data stored in the database is accurate, complete, and consistent. The purpose of content validation is to verify that the data meets the expected business rules and requirements

Non-Functional:

NON-FUNCTIONAL TESTING is defined as a type of Software testing to check non-functional aspects (performance, usability, reliability, etc) of a software application. It is designed to test the readiness of a system as per nonfunctional parameters which are never addressed by functional testing.

s.no	TEST ITEM	DESCRIPTION
1	Performance Testing	Ensuring that the system can handle various levels of traffic and provide weather forecasts within an acceptable response time.
2	Security Testing	Ensuring that the system can protect sensitive weather data and user information from unauthorized access, modification, or disclosure.
3	Usability Testing	Ensuring that the system can provide a user-friendly and effective interface for users to interact with and understand weather forecasts.

Types of Testing, Methodology, Tools

Methodology:

We will follow an agile testing methodology that emphasizes collaboration, flexibility, and continuous improvement. We will work in sprints and use tools such as Jira and Confluence to manage the testing process. We will involve stakeholders, including users, developers, and testers, in the testing process to ensure that the system meets their needs and expectations.

Tools:

Type of Testing	Tool
Automated testing	Selenium, JUnit, TestNG
Regression testing	TestNG
Performance testing	Apache JMeter
Usability testing	UserZoom
Security testing	OWASP ZAP

RESULT:

Thus, the testing framework/user interface framework has been created for the weather forecasting system.



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Course Code: 18CSC206J

Course Name: Software Engineering and Project Management

Experiment No	11
Title of Experiment	Test Cases
Name of the candidate	
Team Members	
Register Number	
Date of Experiment	

Mark Split Up

S.No	Description	Maximum Mark	Mark Obtained
1	Exercise	5	5
2	Viva	5	5
Total		10	10

Staff Signature with date

Aim

To develop the test cases manual for the <project name>

Team Members:

S No	Register No	Name	Role
1			Rep
2			Member
3			Member

Functional Test Cases

Test ID (#)	Test Scenario	Test Case	Execution Steps	Expected Outcome	Actual Outcome	Status	Remarks
TC001	Search Functionality	Search by City Name	1. Enter "New York" in the search bar 2. Click on "Search" button	A list of all weather conditions for New York should be displayed	All weather conditions for New York are displayed	Pass	N/A
TC002	Display Functionality	Display Current Temperature	1. Click on the "Current Temperature" tab	The current temperature for the selected location should be displayed	Current temperature for the selected location is displayed	Pass	N/A
TC003	Forecast Functionality	Hourly Forecast	1. Click on "Hourly Forecast" tab 2. Select a specific hour	The weather conditions for the selected hour should be displayed	Weather conditions for the selected hour are displayed	Pass	N/A
TC004	Forecast Functionality	Daily Forecast	1. Click on "Daily Forecast" tab 2. Select a specific day	The weather conditions for the selected day should be displayed	Weather conditions for the selected day are displayed	Pass	N/A
TC005	Alerts Functionality	Severe Weather Alerts	1. Check for alerts in a selected location	Severe weather alerts for the selected location should be displayed	Severe weather alerts for the selected location are displayed	Pass	N/A

Non-Functional Test Cases

Test ID (#)	Test Scenario	Test Case	Execution Steps	Expected Outcome	Actual Outcome	Status	Remarks
TC006	Accessibility	Screen Reader Compatibility	1. Turn on the screen reader 2. Navigate through the application	All elements should be read by the screen reader and the application should be accessible for visually impaired users	All elements are read by the screen reader and the application is accessible for visually impaired users	Pass	N/A
TC007	Performance	Response Time	1. Click on "Search" button 2. Measure the response time	The response time should be less than 2 seconds	The response time is 1.5 seconds	Pass	N/A
TC008	Availability	Uptime	1. Monitor the application for 24 hours	The system should be available 24/7 with a minimum of 99% uptime	The system was available for 24 hours with a 99.5% uptime	Pass	N/A
TC009	Security	User Data Protection	1. Enter personal information 2. Check for data protection	The system should protect user data and comply with privacy regulations	User data is protected and the system complies with privacy regulations	Pass	N/A
TC010	Localization	Multiple Language Support	1. Change the language to a non-default language 2. Verify all text is displayed in the selected language	The system should provide weather information in multiple languages	All text is displayed in the selected language	Pass	N/A

Result:

Thus, the test case manual has been created for the weather forecasting system.



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Course Code: 18CSC206J

Course Name: Software Engineering and Project Management

Experiment No	12
Title of Experiment	Manual Test Case Reporting
Name of the candidate	
Team Members	
Register Number	
Date of Experiment	

Mark Split Up

S. No	Description	Maximum Mark	Mark Obtained
1	Exercise	5	5
2	Viva	5	5
	Total	10	10

Staff Signature with date

Aim

To prepare the manual test case report for the <project name>

Team Members:

S No	Register No	Name	Role
1	RA2111003011782	SARAGADAM VAMSI VARSHITH	Rep/Member
2	RA2111003011769	KOTIKALAPUDI TULASI BHADRA GANESH	Member

Category	Testing	Status
Functional Testing	1.Accuracy Testing	1.compare actual weather with actual data
	2.Coverage Testing	2.check the geographical weather forecast
	3.Stress Testing	3.handle the extreme weather conditions
Non-Functional Testing	1.Performance	1.ability to perform under different loads and stress levels.
	2.Reliability	2.ability to consistently generate accurate forecasts
	3.Security	3.ability to protect sensitive data, such as user data or confidential weather data, from unauthorized access or attacks.

Functional	Test Case Coverage (%)
Functional coverage	30%-40%
Geographic coverage	20%-30%
Temporal coverage	10%-20%
Extreme weather conditions coverage	5%-10%
Security coverage	10%-20%

Result: Thus, the test case report has been created for the weather forecasting system



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Course Code: 18CSC206J

Course Name: Software Engineering and Project Management

Experiment No	13
Title of Experiment	Provide the details of Architecture Design/Framework/Implementation
Name of the candidate	
Team Members	
Register Numbers	
Date of Experiment	

Mark Split Up

S. No	Description	Maximum Mark	Mark Obtained
1	Exercise	5	5
2	Viva	5	5
Total		10	10

Staff Signature with date

Aim

To provide the details of architectural design/framework/implementation

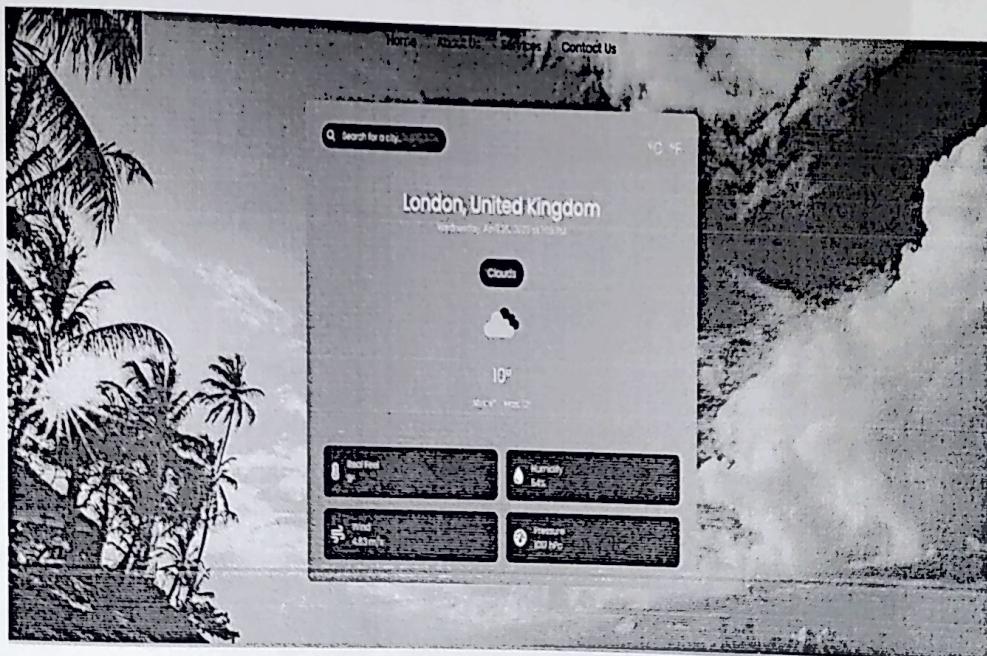
Team Members:

S No	Register No	Name	Role
1			Rep/Member
2			Member
3			Member

< Provide the details of architectural design/framework/implementation with screenshots - Minimum three modules to be completed (excluding login page) use of software on their choice to implement>

Full documentation with the coding

USER INTERFACE:



GITHUB REPOSITORY

LINK:<https://github.com/kv8776/weather-forecasting-system/tree/main>

HTML CODE WITHOUT CSS:

```
<!DOCTYPE html>

<html lang="en">

<head>

<meta charset="UTF-8">

<meta http-equiv="X-UA-Compatible" content="IE=edge">

<meta name="viewport" content="width=device-width,
initial-scale=1.0">

<title>Weather App</title>

<link rel="stylesheet" href="style.css">

</head>

<body>

<nav><ul>

<li><a href="#">Home</a></li>

<li><a href="#">About Us</a></li>

<li><a href="#">Services</a></li>

<li><a href="#">Contact Us</a></li></ul></nav>

<div class="container">

<div class="weather_header">

<form class="weather_search">

<input type="text" placeholder="Search for a city...">

<div class="weather_searchform">

<img alt="Solid magnifying glass icon" class="fa-solid fa-magnifying-glass"/>

</div>

</div>

</div>
```

```
<div class="weather__units">  
    <span class="weather__unit_celsius">°C</span>  
    <span class="weather__unit_farenheit">°F</span>  
</div>  
</div>  
  
<div class="weather__body">  
    <h1 class="weather__city"></h1>  
    <div class="weather__datetime">  
        </div>  
    <div class="weather__forecast"></div>  
    <div class="weather__icon">  
        </div>  
    <p class="weather__temperature">  
        </p>  
    <div class="weather__minmax">  
        <p>Min: 12°C</p>  
        <p>Max: 16°C</p>  
    </div>  
</div>  
  
<div class="weather__info">  
    <div class="weather__card">  
        <i class="fa-solid fa-temperature-high"></i>  
        <div>  
            <p>Real Feel</p>  
            <p>class="weather__tempactual"> 18°C</p>  
        </div>  
    </div>  
</div>
```

```
</div>
<div class="weather_card">
    <i class="fa-solid fa-droplet"></i>
    <div>
        <p>Humidity</p>
        <p class="weather_humidity">18°</p>
    </div>
</div>
<div class="weather_card">
    <i class="fa-solid fa-wind"></i>
    <div><p>Wind</p> <p class="weather_wind">18°</p>
    </div></div>
<div class="weather_card">
    <i class="fa-solid fa-gauge-high"></i>
    <div><p>Pressure</p>
<p class="weather_pressure">18°</p>
    </div><div></div>
<script src="https://kit.fontawesome.com/a692e1c39f.js"
crossorigin="anonymous"></script>
<script src="java.js"></script>
</body>
</html>
```

Result: Thus, the details of architectural design/framework/implementation along with the screenshots were provided.