SAVITRIBAI PHULE PUNE UNIVERSITY

A PRELIMINARY PROJECT REPORT ON

Privacy-Preserving Optimal Meeting Location Determination on Mobile Devices

SUBMITTED TOWARDS THE
PARTIAL FULFILLMENT OF THE REQUIREMENTS OF

BACHELOR OF ENGINEERING (Computer Engineering)

BY

Mr. Nikhil Mahamuni	Exam No:
Mr. Suraj Mohanty	Exam No:
Mr. Suraj Lonkar	Exam No:
Mr. Jayram Raut	Exam No:

Under The Guidance of

Prof. Guide Name

DEPARTMENT OF COMPUTER ENGINEERING
College Name
College Address

College Name
DEPARTMENT OF COMPUTER ENGINEERING

CERTIFICATE

This is to certify that the Project Entitled

Privacy-Preserving Optimal Meeting Location Determination on Mobile Devices

Submitted by

Mr. Nikhil Mahamuni	Exam No:
Mr. Suraj Mohanty	Exam No:
Mr. Suraj Lonkar	Exam No:
Mr. Jayram Raut	Exam No:

is a bonafide work carried out by Students under the supervision of Prof. Guide Name and it is submitted towards the partial fulfillment of the requirement of Bachelor of Engineering (Computer Engineering) Project.

Prof. Guide Name
Internal Guide
Dept. of Computer Engg.

Prof. HOD Name
H.O.D
Dept. of Computer Engg.

Abstract

Equipped with state-of-the-art smartphones and mobile devices, todays highly interconnected urban population is increasingly dependent on these gadgets to organize and plan their daily lives. These applications often rely on current (or preferred) locations of in- dividual users or a group of users to provide the desired service, which jeopardizes their privacy; users do not necessarily want to reveal their current (or preferred) locations to the service provider or to other, possibly untrusted, users. In this paper, we propose privacy- preserving algorithms for determining an optimal meeting location for a group of users. We perform a thorough privacy evaluation by formally quantifying privacy-loss of the pro- posed approaches. In order to study the performance of our algorithms in a real deploy- ment, we implement and test their execution efficiency on Nokia smartphones. By means of a targeted user-study, we attempt to get an insight into the privacy-awareness of users in location-based services and the usability of the proposed solutions.

Acknowledgments

Please Write here Acknowledgment.Example given as

It gives us great pleasure in presenting the preliminary project report on ***'BE PROJECT TITLE'***.

I would like to take this opportunity to thank my internal guide ***Prof. Guide Name*** *for giving me all the help and guidance I needed. I am really grateful to them for their kind support. Their valuable suggestions were very helpful.*

I am also grateful to ***Prof. HOD Name****, Head of Computer Engineering Department, CollegeName for his indispensable support, suggestions.*

In the end our special thanks to ***Other Person Name*** *for providing various resources such as laboratory with all needed software platforms, continuous Internet connection, for Our Project.*

Nikhil Mahamuni
Suraj Mohanty
Suraj Lonkar
Jayram Raut
(B.E. Computer Engg.)

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CHAPTER 1

SYNOPSIS

1.1 PROJECT TITLE

Privacy-Preserving Optimal Meeting Location Determination on Mobile Devices

1.2 PROJECT OPTION

Internal project

1.3 INTERNAL GUIDE

Prof. Internal Guide Name

1.4 SPONSORSHIP AND EXTERNAL GUIDE

Please write if any sponsorship

1.5 TECHNICAL KEYWORDS (AS PER ACM KEYWORDS)

- Mobile app

  A mobile app is a computer program designed to run on mobile devices such as smartphones and tablet computers. Most such devices are sold with several apps included as pre-installed software, such as a web browser, email client, calendar, mapping program, and an app for buying music or other media or more apps.

- Location based Services

  A location-based service (LBS) is a software application for a IP-capable mobile device that requires knowledge about where the mobile device is located.

- privacy.

  Privacy is the ability of an individual or group to seclude themselves, or information about themselves, and thereby express themselves selectively. The boundaries and content of what is considered private differ among cultures and individuals, but share common themes. When something is private to a person, it usually means that something is inherently special or sensitive to them.

The domain of privacy partially overlaps security (confidentiality), which can include the concepts of appropriate use, as well as protection of information. Privacy may also take the form of bodily integrity.

1.6 PROBLEM STATEMENT

The problem of privacy preserving location has received little or no attention in the liter- ature. Although considering aspects such as user preferences and constraints, their work does not address any security or privacy issues. All private information about users is pub- lic. Privacy of a users location or location preferences, with respect to other users and the third-party service provider, is a critical concern in such location-sharing-based applications. For instance, such information can be used to de-anonymize users and their availabilities, to track their preferences or to identify their social networks.
In this work, the problem of finding a rendezvous point among a set of user-proposed loca- tions, such that (i) The rendez-vous point is fair with respect to the given input locations, (ii) each user learns only the final rendez-vous location and (iii) no participating user or third-party server learns private location preference of any other user involved in the com- putation. The algorithm termed as Privacy-Preserving Fair Rendez-Vous Point (PPFRVP) algorithm

1.7 ABSTRACT

Equipped with state-of-the-art smartphones and mobile devices, todays highly interconnected urban population is increasingly dependent on these gadgets to organize and plan their daily lives. These applications often rely on current (or preferred) locations of in- dividual users or a group of users to provide the desired service, which jeopardizes their privacy; users do not necessarily want to reveal their current (or preferred) locations to the service provider or to other, possibly untrusted, users. In this paper, we propose privacy- preserving algorithms for determining an optimal meeting location for a group of users. We perform a thorough privacy evaluation by formally quantifying privacy-loss of the pro- posed approaches. In order to study the performance of our algorithms in a real deploy- ment, we implement and test

their execution efficiency on Nokia smartphones. By means of a targeted user-study, we attempt to get an insight into the privacy-awareness of users in location-based services and the usability of the proposed solutions.

1.8 GOALS AND OBJECTIVES

- To preserver the user privacy.
- To find the Optimal location which will be very efficient for everyone.

1.9 RELEVANT MATHEMATICS ASSOCIATED WITH THE PROJECT

System Description:

- Input: Employee login to the system and send two locations to the server.
- Output: Final Optimal Location.
- Identify data structures, classes, divide and conquer strategies to exploit distributed/parallel/concurrent processing, constraints.
  Our system work as a distribute manner. It means that one module is dependant on the another module. The output of previous module is required as a input to the next module. So that before executing previous module we cannot execute the next module.
- Functions : Identify Objects, Morphisms, Overloading in functions, Functional relations
- Mathematical formulation if possible
  Mathematical Model:
  1. Employee:
  Set (U)=s0,s2,s3,u0,u1,u2,u3
  U0- User authentication
  U1- send two locations to server
  U2- choose any one location from both location

U3-send selected location to the server

2. Server:

Set (S)=u1,u3,m2,s0,s1,s2,s3

S0- send message for meeting to the employee

S1- Send the locations to the Optimal Meeting

Calculation Module

S2- send both optimal location to the employee

S2- select maximum count from both location

S3-send final location to the employee

3. Optimal Meeting calculation:

Set (M)=s1,m0,m1,m2

M0- find optimal location from first list

M1- find optimal location from second list

M2-send both optimal locations to server

Union and intersection of sets:

Set (U)=s0,s2,s3,u0,u1, u2,u3

Set (S)=u1,u3,m2,s0,s1,s2,s3

Set (M)=s1,m0,m1,m2

U union S= s0,s2,s3,u0,u1, u2,u3,m2,s1

U intersection S= s0,s2,s3,u1,u3

S U M= u1,u3,m2,s0,s1,s2,s3,m0,m1,m2

S intersection M=m2,s1

Venn Diagrams:

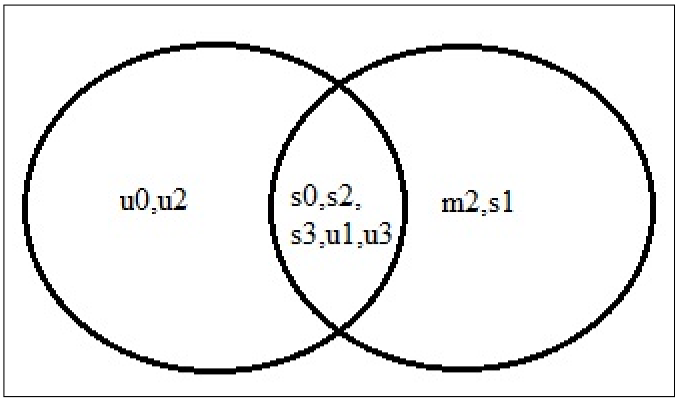

Figure 1.1: U intersection S

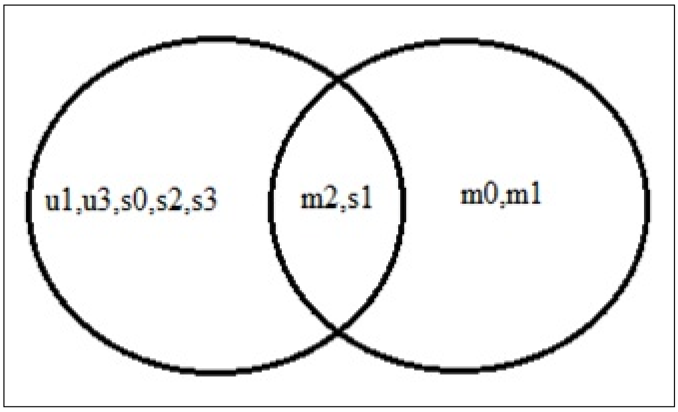

Figure 1.2: S intersection M

- Success Conditions: Our system will give the expected result
- Failure Conditions: Without android phone we cannot run this application

1.10 NAMES OF CONFERENCES / JOURNALS WHERE PAPERS CAN BE PUBLISHED

- IEEE/ACM Conference/Journal 1
- Conferences/workshops in IITs
- Central Universities or SPPU Conferences
- IEEE/ACM Conference/Journal 2

1.11 REVIEW OF CONFERENCE/JOURNAL PAPERS SUPPORTING PROJECT IDEA

- MobiShare: Sharing context-dependent data and services from mobile sources
  The rapid advances in wireless communications technology and mobile computing have enabled personal mobile devices that we use in everyday life to become information and service providers by complementing or replacing fixed-location hosts connected to the wireline network. Such mobile resources is highly important for other moving users, creating significant opportunities for many interesting and novel applications. The MobiShare architecture provides the infrastructure for ubiquitous mobile access and mechanisms for publishing, discovering and accessing heterogeneous mobile resources in a large area, taking into account the context of both sources and requestors. Any wireless communication technology could be used between a device and the system. Furthermore, the use of XML-related languages and protocols for describing and exchanging metadata gives the system a uniform and easily adaptable interface, allowing a variety of devices to use it. The overall approach is data-centric and service-oriented, implying that all devices are treated as producers or requestors of data wrapped as information services.

- On the anonymity of home/work location pairs
  Many applications benefit from user location data, but main problem is that the location data raises privacy concerns. Anonymization can protect privacy, but identities can sometimes be inferred from supposedly anonymous data. A new attack on the anonymity of location data studies by this paper. We show that if the approximate locations of an individual's home and workplace can both be deduced from a location trace, then the median size of the individual's anonymity set in the U.S. working population is 1, 21 and 34,980, for locations known at the granularity of a census block, census track and county respectively. The location data of people who live and work in different regions can be re-identified even more easily. Our results show that the threat of re-identification for location data is much greater when the individual's home

and work locations can ¡em¿both¡/em¿ be deduced from the data. To preserve anonymity, we offer guidance for obfuscating location traces before they are disclosed.

- Evaluating the privacy risk of location-based services
  In modern mobile networks, users increasingly share their location with third-parties in return for location-based services. Previous works show that operators of location-based services may identify users based on the shared location information even if users make use of pseudonyms. In this paper, we push the understanding of the privacy risk further. We evaluate the ability of location-based services to identify users and their points of interests based on different sets of location information. We consider real life scenarios of users sharing location information with location-based services and quantify the privacy risk by experimenting with real-world mobility traces.

- Privacy of community pseudonyms in wireless peer-to-peer networks
  Wireless networks offer novel means to enhance social interactions. In particular, peer-to-peer wireless communications enable direct and real-time interaction with nearby devices and communities and could extend current online social networks by providing complementary services including real-time friend and community detection and localized data sharing without infrastructure requirement. After years of research, the deployment of such peer-to-peer wireless networks is finally being considered. A fundamental primitive is the ability to discover geographic proximity of specific communities of people (e.g, friends or neighbors). To do so, mobile devices must exchange some community identifiers or messages. We investigate privacy threats introduced by such communications, in particular, adversarial community detection. We use the general concept of community pseudonyms to abstract anonymous community identification mechanisms and define two distinct notions of community privacy by using a challenge-response methodology. An extensive cost analysis and simulation results throw further light on the feasibility of these mechanisms in the upcoming generation of wireless peer-to-peer networks.

- rust no one: A decentralized matching service for privacy in location based services

  We propose a new approach to ensure privacy in location based services, without requiring any support from atrusted entity. We observe that users of location based services are sensitive about their i) location coordinates and ii) their in- terests and social relationships, as captured in their queries. We also observe there are entities that naturally have ac- cess to at least one of these pieces of information. The user and/or their mobile operator has access to their current lo- cation, and the LBS provider needs to know of the interests (in businesses, services and acquaintances) of a user. In this paper we consider whether it is possible for these entities to exchange information such that a users queries to the LBS can be answered without i) any one entity coming to know of all sensitive information ii) a loss in the quality of service of the query, or an inordinate load on the user. Specifically, we outline the design of a decentralized matching service that takes encoded information from both the participating entities, and creates triggers when a user, and their objects of interest are in the vicinity of each other. Given that each component of the matching service has access to only a lim- ited amount of encoded information, we argue that it will be impossible to recreate any sensitive user-specific informa- tion.

- Koi: A location-privacy platform for smart- phone apps

  In this paper, we propose privacy-preserving location- based matching as a fundamental platform primitive and as an alternative to exposing low-level, latitude-longitu de (lat-long) coordinates to applications. Applications set rich location-based triggers and have these be fired based on location updates either from the local device or from a remote device (e.g., a friends phone). Our Koi platform, comprising a privacy-preserving matching service in the cloud and a phone-based agent, realizes this primitive across multiple phone and browser platforms. By mask- ing low-level lat-long information from applications, Koi not only avoids leaking privacy-sensitive information, it also eases the task of programmers by providing a higher-level abstraction that is easier for applications t o build upon. Kois privacy-preserving protocol prevents the cloud service from tracking users. We verify the non-tracking properties of Koi using a theorem prover, illustrate how privacy guarantees can easily be added to a wide range of location-based applications, and show that our public deployment is performant, being able to perform 12K matches per second on a single core

- The shy mayor: Private badges in geosocial networks
  Location based social or g eosocial networks (GSNs) have recently emerged as a natural combination of location b ased services with online social networks: users register their location and activities, share it with friends and achieve special st atus (e.g., mayorship badges) based on aggregate location predicate s. Boasting millions of users and tens of daily check-ins, such ser- vices pose significant privacy threats: user location infor mation may be tracked and leaked to third parties. Conversely, a sol ution enabling location privacy may provide cheating capabiliti es to users wanting to claim special location status. In this pape r we introduce new mechanisms that allow users to (inter)act pri vately in todays geosocial networks while simultaneously ensuri ng honest behaviors. Implementations show that the solutions are efficient: the provider can support thousands of check-ins a nd hundreds of status verifications per second.

- erosquare: A privacy-friendly location hub for geosocial applications
  The localization abilities of smartphones have pro- vided a huge boost to the popularity of geosocial applications, which facilitate social interaction between users geographically close to each other. However, todays geosocial applications raise privacy concerns due to application providers storing large amounts of information about users (e.g., profile information) and locations (e.g., users present at a location). We propose Zerosquare, a privacy-friendly location hub that encourages the development of privacy-preserving geosocial applications. Our primary goal is to store information such that no entity can link a users identity to her location. Other goals include decoupling storing data from manipulating data for social networking purposes, designing an architecture flexible enough to support a wide range of use cases, and limiting

client-side computation. Zerosquare consists of two separate server components for storing information about users and about locations, respectively, and optional cloud components for supporting applications. We describe the design of the API exposed by the server components and demonstrate how it can be used to build several sample geosocial applications. We provide a proof-of-concept implementation using Python for the server components and the Android platform for the mobile devices and build several real- world geosocial applications on top of Zerosquare. Finally, we present experimental results that demonstrate the practicality of Zerosquare

- method for obtaining digital signatures and public-key cryptosystems An encryption method is presented with the novel property that publicly re- vealing an encryption key does not thereby reveal the corresponding decryption key. This has two important consequences:
  1. Couriers or other secure means are not needed to transmit keys, since a message can be enciphered using an encryption key publicly revealed by the intended recipient. Only he can decipher the message, since only he knows the corresponding decryption key.
  2. A message can be signed" using a privately held decryption key. Anyone can verify this signature using the corresponding publicly revealed encryption key. Signatures cannot be forged, and a signer cannot later deny the validity of his signature. This has obvious applications in electronic mail" and electronic funds transfer" systems.

- public key cryptosystem and a signature scheme based on discrete logarithms A new signature scheme is proposed, together with an implementation of the Diffie-Hellman key distribution scheme that achieves a public key cryptosystem. The security of both systems relies on the difficulty of computing discrete logarithms over finite fields

1.12 PLAN OF PROJECT EXECUTION

Project planning emphasizes on following aspects:

Work Breakdown: Load the Work Breakdown Structure data into the planning and scheduling repositories. As the Work Breakdown Structure content is derived, progressively load the data into the planning and scheduling repositories. Generate reports, review the content and progressively update the data. This process continues on an iterative basis.

Hierarchical Tree of activities and outcomes.

Make work statement for each task: The project schedules show the timing and sequence of tasks within a project, as well as the project duration and consists of tasks, dependencies among tasks, durations, constraints, milestones and other time oriented project information. The schedules specify the relative beginning and ending times of activities and their occurrence times. The schedules may be presented on a calendar framework or on an elapsed time scale. For the individual project being planned, the Work Breakdown Structure and task dependencies are used to develop estimates, resource allocations and an initial critical path prior to integrating it with other work - streams and optimizing the overall schedule.

Responsibilities and involvement.

Budget and time estimates: Means that the duration assigned to the task remains fixed whether the resources assigned to the task are increased or decreased. As a result, the change in resources will change the tasks work effort requirement. The selection of the appropriate category depends upon whether the duration of the task can be shortened by assigning more resource to it. Duration is defined as the total span of working time required to complete a task. To estimate project length, the approximate elapsed time for each task is calculated using the formula: Phase or Rolling Wave Planning.

In larger projects, it may be acceptable to consider the entire project at a high level and only perform detailed planning and scheduling for one or two stages of the project at a time. This may result in a more accurate short term view and may save rework in correcting information at a later stage in the light of less uncertainty.This is often referred to as Phase or Rolling Wave Planning.

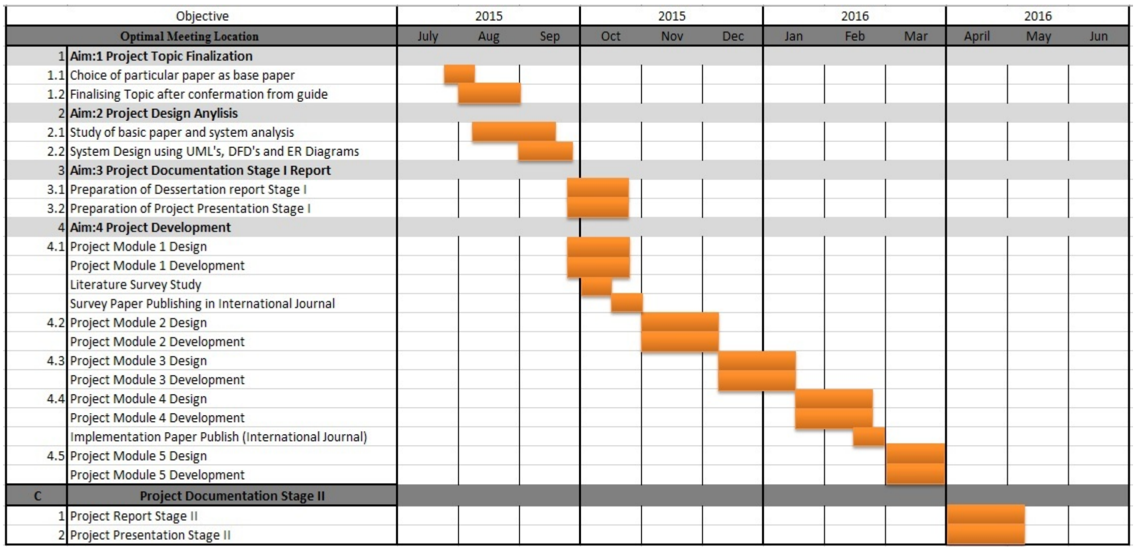

Figure 1.3: Planning Procedure

Above figure shows the Plan of Project that will be the basis for the execution and tracking of all the project activities, which is used throughout the life of the project and kept up to date to reflect the actual accomplishments and plans of the project. Requirement Analysis and study part of the project was as follows:

- Understanding the problem definition;
- Understanding the current scenario in Market;
- Gathering information about required Software;
- Gathering information about required Software Resources;
- Preparing preliminary design of overall work flow of project;
- Deciding the modules required for overall execution.

CHAPTER 2

TECHNICAL KEYWORDS

2.1 AREA OF PROJECT

Networking

2.2 TECHNICAL KEYWORDS

- Mobile app

  A mobile app is a computer program designed to run on mobile devices such as smartphones and tablet computers. Most such devices are sold with several apps included as pre-installed software, such as a web browser, email client, calendar, mapping program, and an app for buying music or other media or more apps.

- Location based Services

  A location-based service (LBS) is a software application for a IP-capable mobile device that requires knowledge about where the mobile device is located.

- privacy.

  Privacy is the ability of an individual or group to seclude themselves, or information about themselves, and thereby express themselves selectively. The boundaries and content of what is considered private differ among cultures and individuals, but share common themes. When something is private to a person, it usually means that something is inherently special or sensitive to them. The domain of privacy partially overlaps security (confidentiality), which can include the concepts of appropriate use, as well as protection of information. Privacy may also take the form of bodily integrity.

CHAPTER 3

INTRODUCTION

3.1 PROJECT IDEA

- Main idea is to provide practical privacy preserving techniques to solve the FRVP problem, such that neither a third-party, nor participating users, can learn other users locations; participating users only learn the optimal location. The privacy issue in the FRVP problem is representative of the relevant privacy threats in LSBSs.

3.2 MOTIVATION OF THE PROJECT

- Proposed system will have two algorithms for solving the Fair Rendez-Vous Point (FRVP) problem in a privacy-preserving fashion, where each user participates by providing only a single location preference to the FRVP solver or the service provider.

- In addition to the theoretical analysis, we will evaluate the practical efficiency and performance of the proposed algorithms by means of a prototype implementation on a test bed of mobile devices. It will address the multi-preference case, where each user may have multiple prioritized location preferences.

3.3 LITERATURE SURVEY

- MobiShare: Sharing context-dependent data and services from mobile sources The rapid advances in wireless communications technology and mobile computing have enabled personal mobile devices that we use in everyday life to become information and service providers by complementing or replacing fixed-location hosts connected to the wireline network. Such mobile resources is highly important for other moving users, creating significant opportunities for many interesting and novel applications. The MobiShare architecture provides the infrastructure for ubiquitous mobile access and mechanisms for publishing, discovering and accessing heterogeneous mobile resources in a large area, taking into account the context of both sources and requestors. Any wireless communication technology could be used between a device and the system.

Furthermore, the use of XML-related languages and protocols for describing and exchanging metadata gives the system a uniform and easily adaptable interface, allowing a variety of devices to use it. The overall approach is data-centric and service-oriented, implying that all devices are treated as producers or requestors of data wrapped as information services.

- On the anonymity of home/work location pairs

  Many applications benefit from user location data, but main problem is that the location data raises privacy concerns. Anonymization can protect privacy, but identities can sometimes be inferred from supposedly anonymous data. A new attack on the anonymity of location data studies by this paper. We show that if the approximate locations of an individual's home and workplace can both be deduced from a location trace, then the median size of the individual's anonymity set in the U.S. working population is 1, 21 and 34,980, for locations known at the granularity of a census block, census track and county respectively. The location data of people who live and work in different regions can be re-identified even more easily. Our results show that the threat of re-identification for location data is much greater when the individual's home and work locations can ¡em¿both¡/em¿ be deduced from the data. To preserve anonymity, we offer guidance for obfuscating location traces before they are disclosed.

- Evaluating the privacy risk of location-based services

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CHAPTER 4

PROBLEM DEFINITION AND SCOPE

4.1 PROBLEM STATEMENT

To preserver the user privacy and find the Optimal location which will be very efficient for everyone.

4.1.1 Goals and objectives

Goal and Objectives:

- Goal is to provide practical privacy preserving techniques to solve the FRVP problem, such that neither a third-party, nor participating users, can learn other users locations; participating users only learn the optimal location. The privacy issue in the FRVP problem is representative of the relevant privacy threats in LSBSs.

4.1.2 Statement of scope

- A description of the software with Size of input, bounds on input, input validation, input dependency, i/o state diagram, Major inputs, and outputs are described without regard to implementation detail.
- The scope identifies what the product is and is not, what it will and wont do, what it will and wont contain.

4.2 SOFTWARE CONTEXT

- For developing this system we will required and eclipse id and implementation language will be Java. For backend we are going to user MySQL. Above mention software are easily available on internet. So that we can get them easily.

4.3 MAJOR CONSTRAINTS

- The meeting request must be send only those number of persons which are required for meeting.
- The final optimal location should be efficient for every employee.

4.4 METHODOLOGIES OF PROBLEM SOLVING AND EFFICIENCY ISSUES

- TWe will first formulate the FRVP problem as an optimization problem, specifically the k- center problem, and then analytically outline the privacy requirements of the participants with respect to each other and with respect to the third-party service provider. We will use two algorithms for solving the above formulation of the FRVP problem in a privacy- preserving fashion, where each user participates by providing only a single location prefer- ence to the FRVP service provider. The proposed algorithms take advantage of the homomorphic properties of well-known cryptosystems, such as BGN, ElGamal and Paillier, in order to privately compute an optimally fair rendez-vous point from a set of user location preferences.

4.5 SCENARIO IN WHICH MULTI-CORE, EMBEDDED AND DISTRIBUTED COMPUTING USED

Here we arer going to apply the distributed computing methodology because each modules are depends on each other. The output of first module is required as a input to tyhe next module.

4.6 OUTCOME

- In this system, we are going to find the optimal location for meeting.
- In this system, there hides the all the employee details. So that, privacy will preserve.

4.7 APPLICATIONS

- This system will be useful in the organizations which has multiple branches.

Sr. No.	Parameter	Minimum Requirement	Justification
1	CPU Speed	2 GHz	Minimum
2	RAM	2 GB	minimum
3	Hard Disk	80 GB	Minimum
4	Android Phone		

Table 4.1: Hardware Requirements

4.8 HARDWARE RESOURCES REQUIRED

4.9 SOFTWARE RESOURCES REQUIRED

Platform :

1. Operating System: Windows
2. IDE: Eclipse
3. Programming Language: Java
4. Database: MySQL

CHAPTER 5

PROJECT PLAN

5.1 PROJECT ESTIMATES

The Waterfall Model was first Process Model to be introduced. It is also referred to as a linear-sequential life cycle model. It is very simple to understand and use. In a waterfall model, each phase must be completed fully before the next phase can begin. This type of model is basically used for the for the project which is small and there are no uncertain requirements. At the end of each phase, a review takes place to determine if the project is on the right path and whether or not to continue or discard the project. In this model the testing starts only after the development is complete. In waterfall model phases do not overlap.

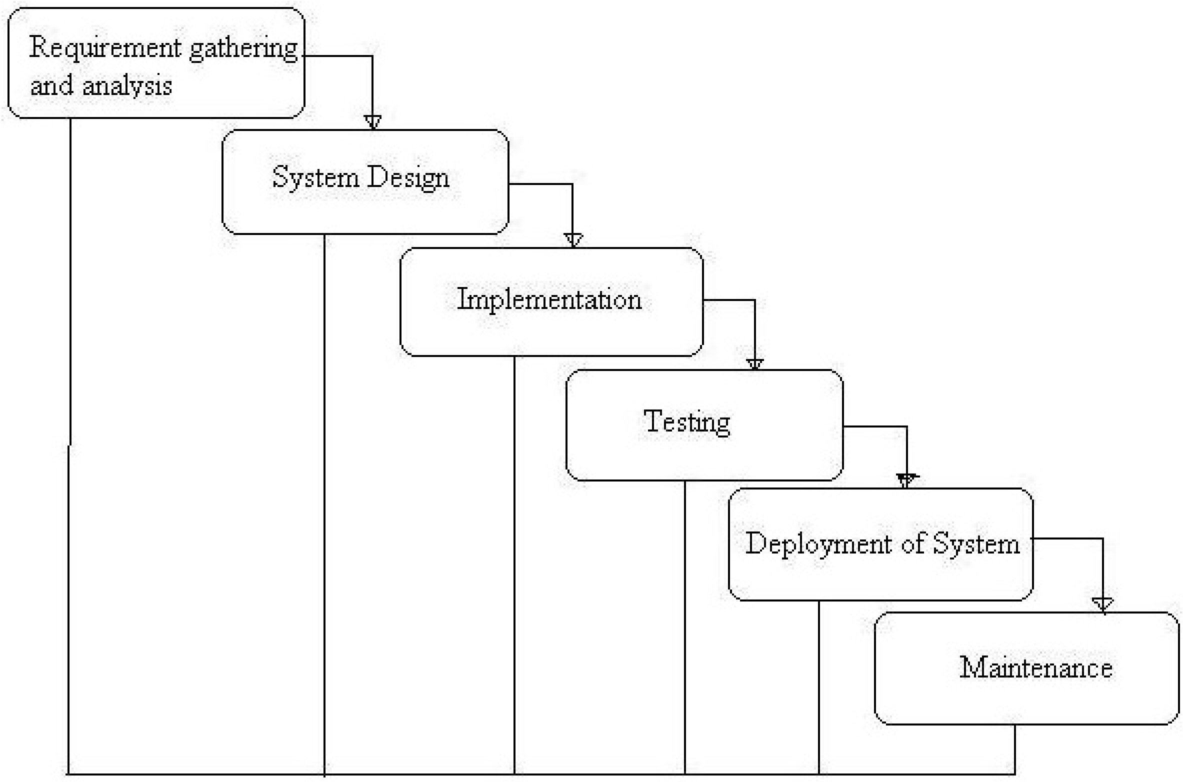

Figure 5.1: Waterfall model

5.1.1 Advantages:

- This model is simple and easy to understand and use.
- It is easy to manage due to the rigidity of the model each phase has specific deliverables and a review process.

- In this model phases are processed and completed one at a time. Phases do not overlap.
- Waterfall model works well for smaller projects where requirements are very well understood.

5.1.2 Reconciled Estimates

5.1.2.1 Time Estimate

Costs of the getting knowledge is depends on the resources and efforts needed for the development of the system.

Line of Co de (LoC):

LINE OF CODE: Estimating LOC for this project is dicult at estimation stages this project is of research or innovative type project. Average estimation of this project is 500 to 600 line of co de.

MAN MONTH UTILIZATION:

Estimation of the man month is divide into following sub activities

1-Technical training of the team member: - This will take nearly 3 to 4 weeks. This will include assembly language, micro controller study etc.

2-Research:-Being an innovative project research for the project is an important part currently it seems to have 1 to 2 months

LOC Based estimation: Efforts in Person in months

Function	**Estimated KLOC**
GUI design	7 1.5-2.0
Logical code	1.8-2.2
Client side validation	1.5-1.8
Server side validation	2.0-2.2
Business logic	2.5-2.8
Total	9.0-10.11

Table 5.1: LOC Based estimation

$E = 3.2 * (KLOC)^1.05$

$E = 3.2 * 9.0^1.05 to 11.0 * 4.2^1.05$

$E = 24.62 to 25.05 months$

Development time in months

D=E/N,

Where E=Efforts in Person in months

N=Number of persons required

D=24.62/4 to 25.2/4

D=6 to 7 months

5.1.2.2 Cost Estimates

Cost of project

C=N*Cp

C=4*5000

C=20,000

The cost of the project is approximately 20,000

5.1.3 Project Resources

Hardware Resources Required:

Minimum 512 MB RAM

Pentium IV Processor and above.

Minimum 40 GB hard disk.

Monitor with normal visual Resolution

Android phone

Software Resources Required:

OS requirements: Windows XP onwards

Eclipse

Java JDK 1.7

My Sql 5.5

5.2 RISK MANAGEMENT W.R.T. NP HARD ANALYSIS

When solving problems we have to decide the difficulty level of our problem. There are three types of classes provided for that. These are as follows:

- P Class
- NP-hard Class
- NP-Complete Class

NP Class:

Informally the class P is the class of decision problems solvable by some algorithm within a number of steps bounded by some fixed polynomial in the length of the input. Turing was not concerned with the efficiency of his machines, but rather his concern was whether they can simulate arbitrary algorithms given sufficient time. However it turns out Turing machines can generally simulate more efficient computer models (for example machines equipped with many tapes or an unbounded random access memory) by at most squaring or cubing the computation time. Thus P is a robust class and has equivalent definitions over a large class of computer models. Here we follow standard practice and define the class P in terms of Turing machines.

NP Hard:

A problem is NP-hard if solving it in polynomial time would make it possible to solve all problems in class NP in polynomial time. Some NP-hard problems are also in NP (these are called "NP-complete"), some are not. If you could reduce an NP problem to an NP-hard problem and then solve it in polynomial time, you could solve all NP problems. Also, there are decision problems in NP-hard but are not NP-complete, such as the infamous halting problem.

NP-complete:

A decision problem L is NP-complete if it is in the set of NP problems so that any given solution to the decision problem can be verified in polynomial time, and also in the set of NP-hard problems so that any NP problem can be converted into L by a transformation of the inputs in polynomial time. The complexity class NP-complete is the set of problems that are the hardest problems in NP, in the sense that they are the ones most likely not to be in P. If you can find a way to solve an NP-complete problem quickly, then you can use that algorithm to solve all NP problems quickly.

Conclusion:

Our project support only NP-complete class problem because we will get the expected output after implementing this project.

5.2.1 Risk Identification

For risks identification, review of scope document, requirements specifications and schedule is done. Answers to questionnaire revealed some risks.

1. Are the spftwares available for the development?
   Ans: All the required softwares are freely available and hence development will be possible.

2. Are end-users enthusiastically committed to the project and the system/product to be built?
   Ans: Project being academic project, end user will be developers itself.

3. Are requirements fully understood by the software engineering team and its customers?
   Ans: All requirements are fully understood by our team.

4. Have customers been involved fully in the definition of requirements?
   Ans:this is academic level project. So that whatever requirement be specify it should be by our team members and our guide.

5. Do end-users have realistic expectations?
   Ans: Yes.

6. Does the software engineering team have the right mix of skills?
   Ans: Yes, we have.

7. Are project requirements stable?

   Ans: All the basic requirements for this project are stable, Although some being variable but can be fulfilled.

8. Is the number of people on the project team adequate to do the job?

   Ans: Yes.

9. Do all customer/user constituencies agree on the importance of the project and on the requirements for the system/product to be built?

   Ans: Yes

5.2.2 Risk Analysis

The risks for the Project can be analyzed within the constraints of time and quality

ID	Risk Description	Probability	Impact		
			Schedule	Quality	Overall
1	Deadline Risk	Low	Low	High	Low
2	Technology Skill Risk	Low	Low	High	Low

Table 5.2: Risk Table

Probability	Value	Description
High	Probability of occurrence is	$> 75\%$
Medium	Probability of occurrence is	$26 - 75\%$
Low	Probability of occurrence is	$< 25\%$

Table 5.3: Risk Probability definitions [?]

5.2.3 Overview of Risk Mitigation, Monitoring, Management

Following are the details for each risk.

Impact	Value	Description
Very high	$> 10\%$	Schedule impact or Unacceptable quality
High	$5 - 10\%$	Schedule impact or Some parts of the project have low quality
Medium	$< 5\%$	Schedule impact or Barely noticeable degradation in quality Low Impact on schedule or Quality can be incorporated

Table 5.4: Risk Impact definitions [**?**]

Risk ID	1
Risk Description	Development Deadline Risk
Category	Duration of Development.
Source	Software requirement Specification document.
Probability	Low
Impact	High
Response	Mitigate
Strategy	Team Work distribution and task plan
Risk Status	Occurred

Risk ID	2
Risk Description	Technology Skill Risk
Category	Knowledge Requirements
Source	Project Design Specification.
Probability	Low
Impact	High
Response	Mitigate
Strategy	Self study and Internet will be best source for technology knowledge.
Risk Status	Identified

5.3 PROJECT SCHEDULE

5.3.1 Project task set

Major Tasks in the Project stages are:

- Task 1:Topic Finalization
- Task 2: Project design analysis
- Task 3: Project documentation for sem1
- Task 4: Project Development
- Task 5: Project documentation for sem2

5.3.2 Task network

Project tasks and their dependencies are noted in this diagrammatic form.

5.3.3 Timeline Chart

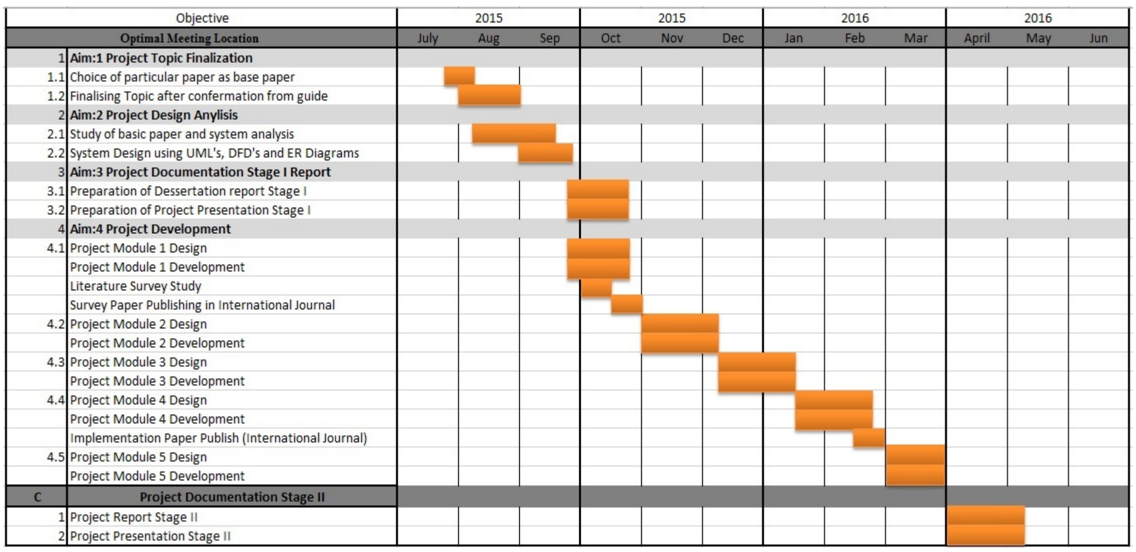

Figure 5.2: Planning Procedure

5.4 TEAM ORGANIZATION

Whatever activities are done related to the project that we all showing all details log to our guide. All the reporting are noted to the guide

5.4.1 Team structure

The team structure for the project is identified. Roles are defined. Our team have four members. We select this topic after discussing with each other. All the membersw performing all the task whatever tasks are assign to the members,

5.4.2 Management reporting and communication

For developing this project, first finalise the project topic after reviewing the multiple project topics. After that we gather the requirements aboud this project. Then we make the synopsis, SRS, PPT and report for sem1.
For all above requirements, our team member and our guied discuss with each other. Every time we maintain all the details about whatever activities are performed by us.

CHAPTER 6

SOFTWARE REQUIREMENT SPECIFICATION (SRS IS TO BE PREPARED USING RELEVANT MATHEMATICS DERIVED AND SOFTWARE ENGG. INDICATORS IN ANNEX A AND B)

6.1 INTRODUCTION

6.1.1 Purpose and Scope of Document

The purpose of this document is to define the requirements of Privacy Preserving optimal meeting location for Mobile Users. In detail, this document will provide a general description of our project, including user requirements, product perspective, and overview of requirements, general constraints. In addition, it will also provide the specific requirements and functionality needed for this project - such as interface, functional requirements and performance requirements.

6.1.2 Overview of responsibilities of Developer

- Perform project design and development activities according to customer specifications.
- Work with Manager in developing project plan, budget and schedule.
- Coordinate with management in preparing project proposals and contractual documents.
- Track project progress regularly and develop status reports to management.
- Ensure that project is completed within allotted budget and timelines.
- Follow company policies and safety regulations for operational efficiency.
- Research and recommend new technologies to carry out project development tasks.
- Provide assistance to other Developers, perform peer reviews and provide feedback for improvements.
- Develop cost reduction initiatives while maintaining quality and productivity.

6.2 USAGE SCENARIO

This system is very helpful for arranging the meeting location which are efficient to every member of meeting.

6.2.1 User profiles

Employee:

Employee register to the system. Then he send the two location to the system after he get the meeting request from server. Then he gets the two optimal location and he select one of them and send it to the server. Finally, employee get the final optimal location from the server.

Server:

Server send the meeting request to the employee. Then it get two locations from every employee and send it to the Optimal; meeting location calculation.It gets the two optimal location to the employee. Then he choose the final optimal location which depends on which count of the location is gretter.

Optimal meeting Calculation:

It get the two locations list from server and calculate the two optimal locations from two list. Finally send these two optimal location to the server.

6.2.2 Use-cases

Sr No.	Use Case	Description	Actors	Assumptions
1	Registration	all employee register to the system by filling their details to the system	employee	all employee has register to the system
2	login	all employee login to the system by entering their loginid and password to the system	employee	all employee has login to the system
3	send locations	all requested should send their location choice to the server	employee	all employee have send their locations to the server
4	send location lists	server should send the location lists to the optimal location calculation	server	server has send the location lists to the optimal location calculation
5	send two optimal locations	optimal meeting location calculation should calculate and send the two optimal locations to the server	optimal meeting calculation	optlmal locations are send to server successfully
6	send two optimal locations	server should send the two optimal locations to the employee	server	optlmal locations are send to employee successfully
7	send one optimal location to server	employee send the one optimal location to server	employee	employee has send the location to the server successfully
6	send final optimal location	server should send the final optimal location to employee	server	server has send the final location to the employee

Table 6.1: Use Cases

6.2.3 Use Case View

Use Case Diagram. Example is given below

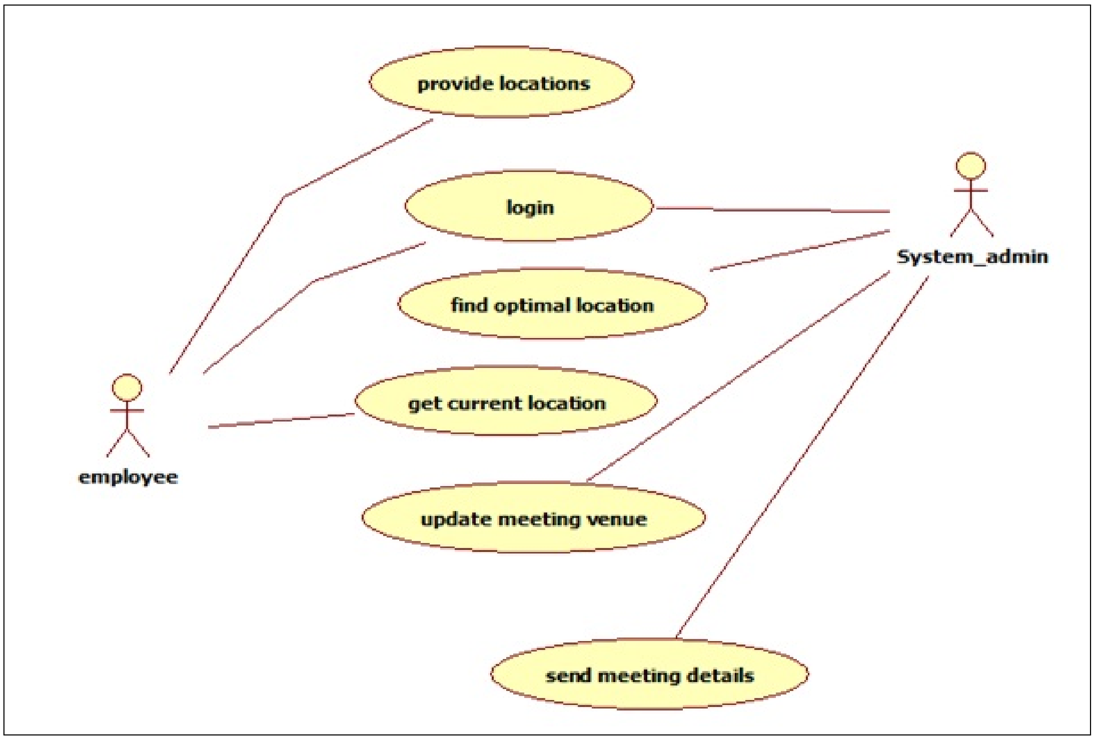

Figure 6.1: Use case diagram

6.3 DATA MODEL AND DESCRIPTION

6.3.1 Data Description

Data objects that will be managed/manipulated by the software are described in this section. The database entities or files or data structures required to be described. For data objects details can be given as below. For storing the all the details of the employee we are using the MySQL database. Using MySQL we can maintain all the user details, user locations and optimal locations, etc.

6.3.2 Data objects and Relationships

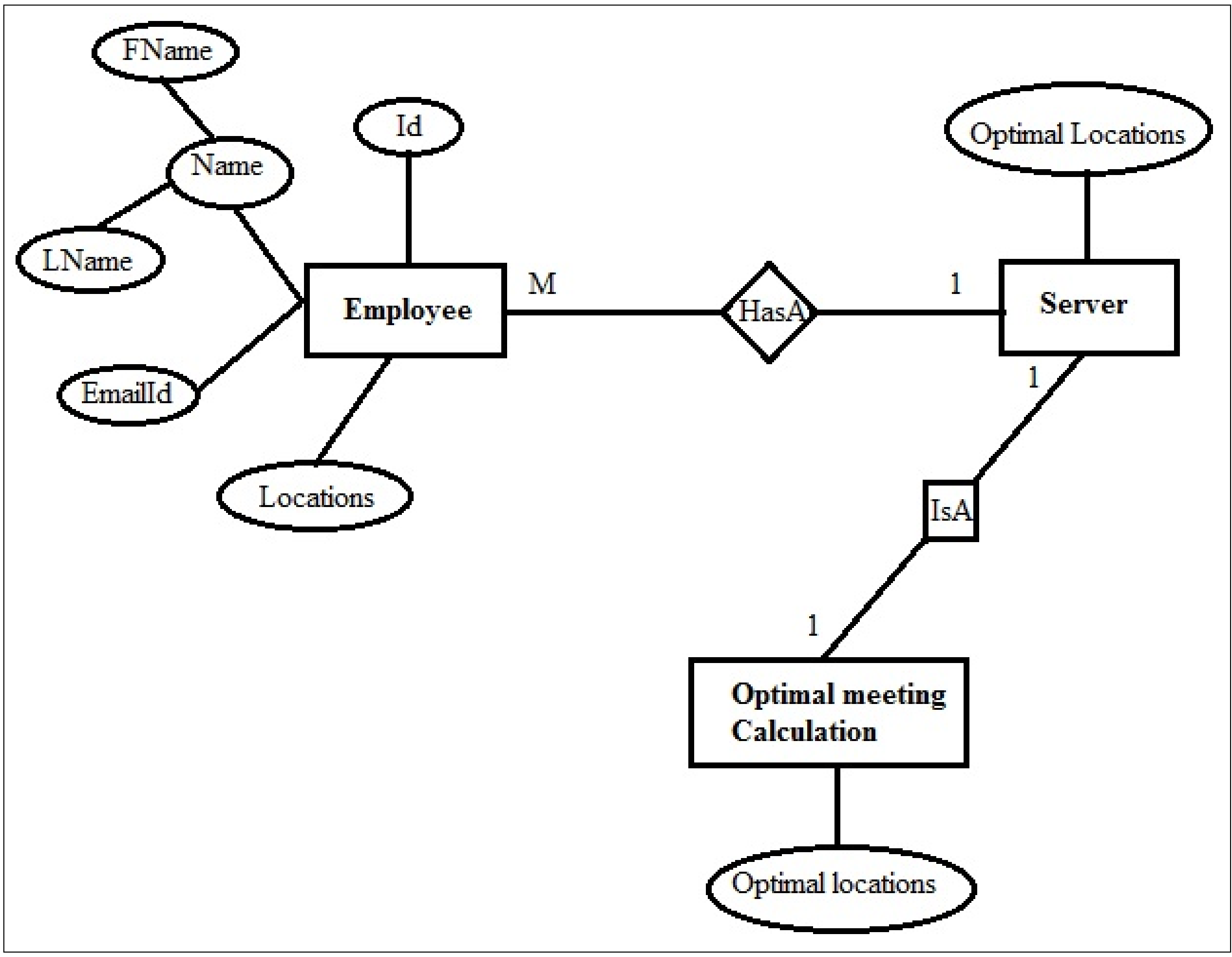

Figure 6.2: ER Diagram

6.4 FUNCTIONAL MODEL AND DESCRIPTION

A description of each major software function, along with data flow (structured analysis) or class hierarchy (Analysis Class diagram with class description for object oriented system) is presented.

6.4.1 Data Flow Diagram

6.4.1.1 Level 0 Data Flow Diagram

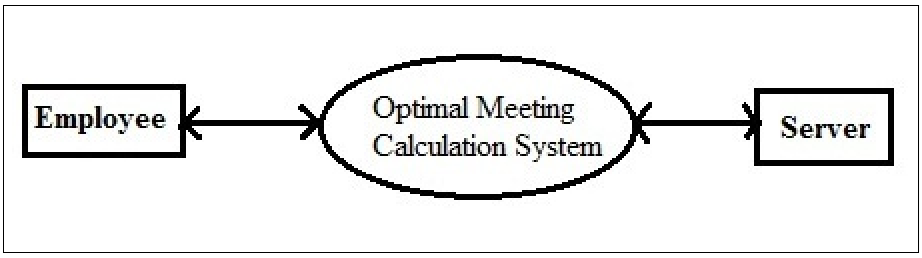

Figure 6.3: Level 0 Data Flow Diagram

6.4.1.2 Level 1 Data Flow Diagram

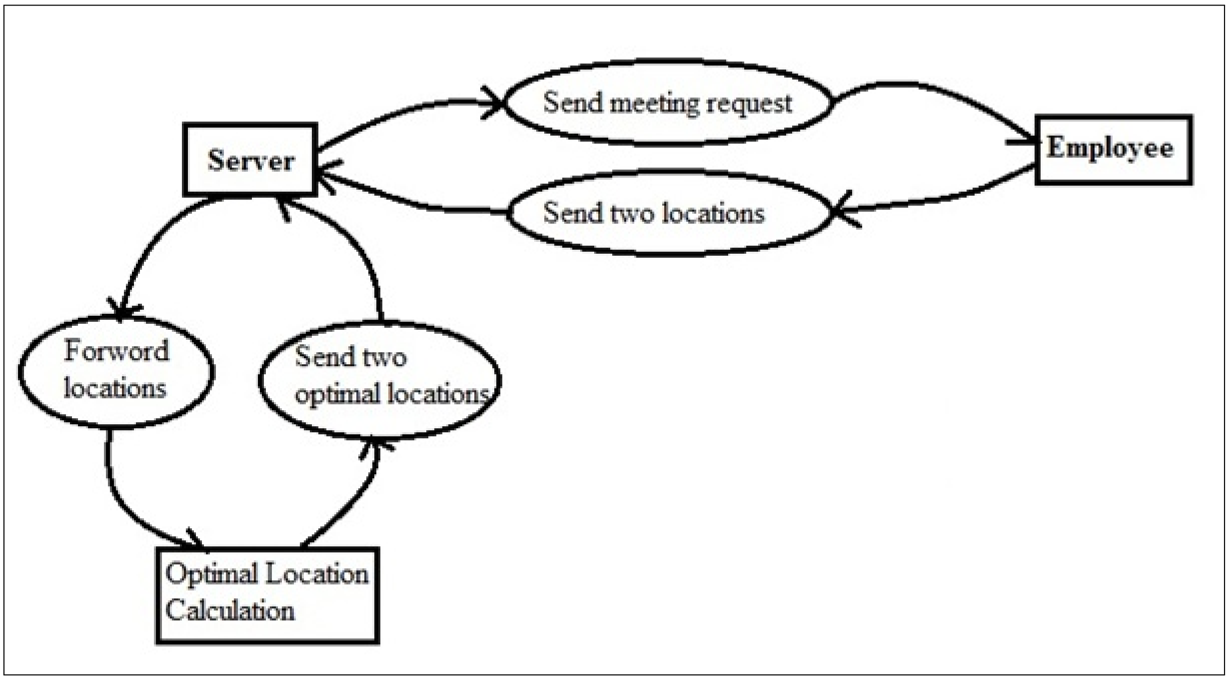

Figure 6.4: Level 1 Data Flow Diagram

6.4.1.3 Level 2 Data Flow Diagram

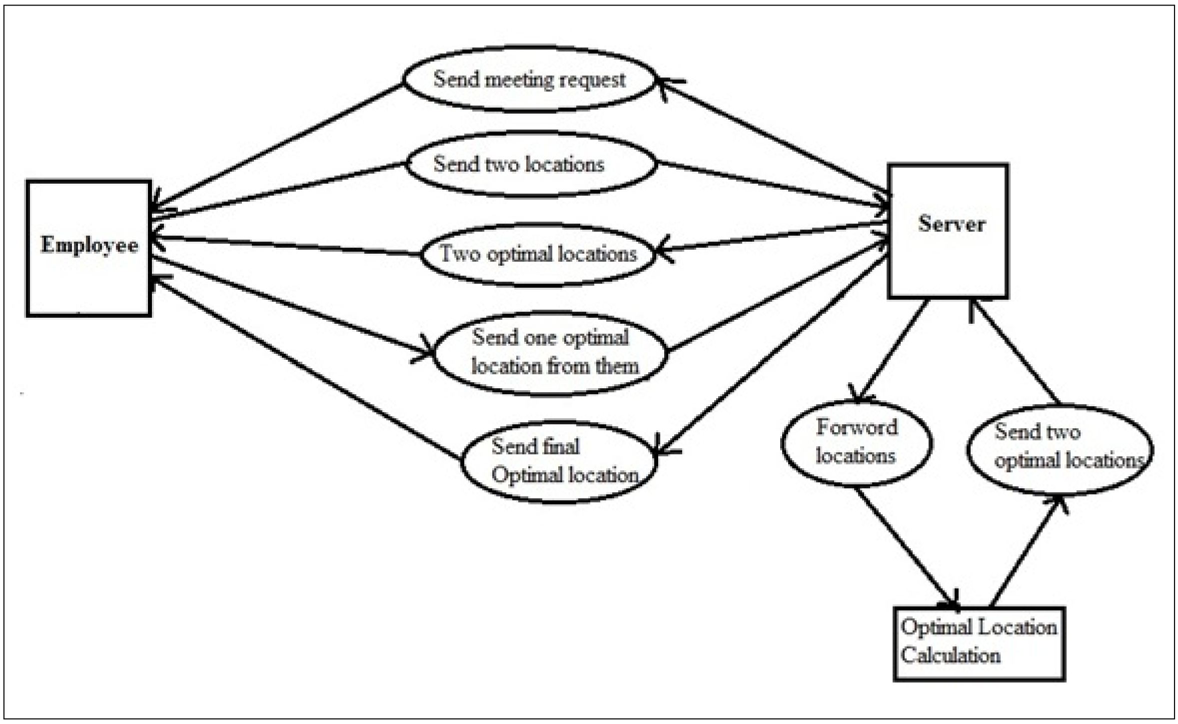

Figure 6.5: Level 2 Data Flow Diagram

6.4.2 Description of functions

A description of each software function is presented. A processing narrative for function n is presented.(Steps)/ Activity Diagrams.

6.4.3 Activity Diagram:

- The Activity diagram represents the steps taken.

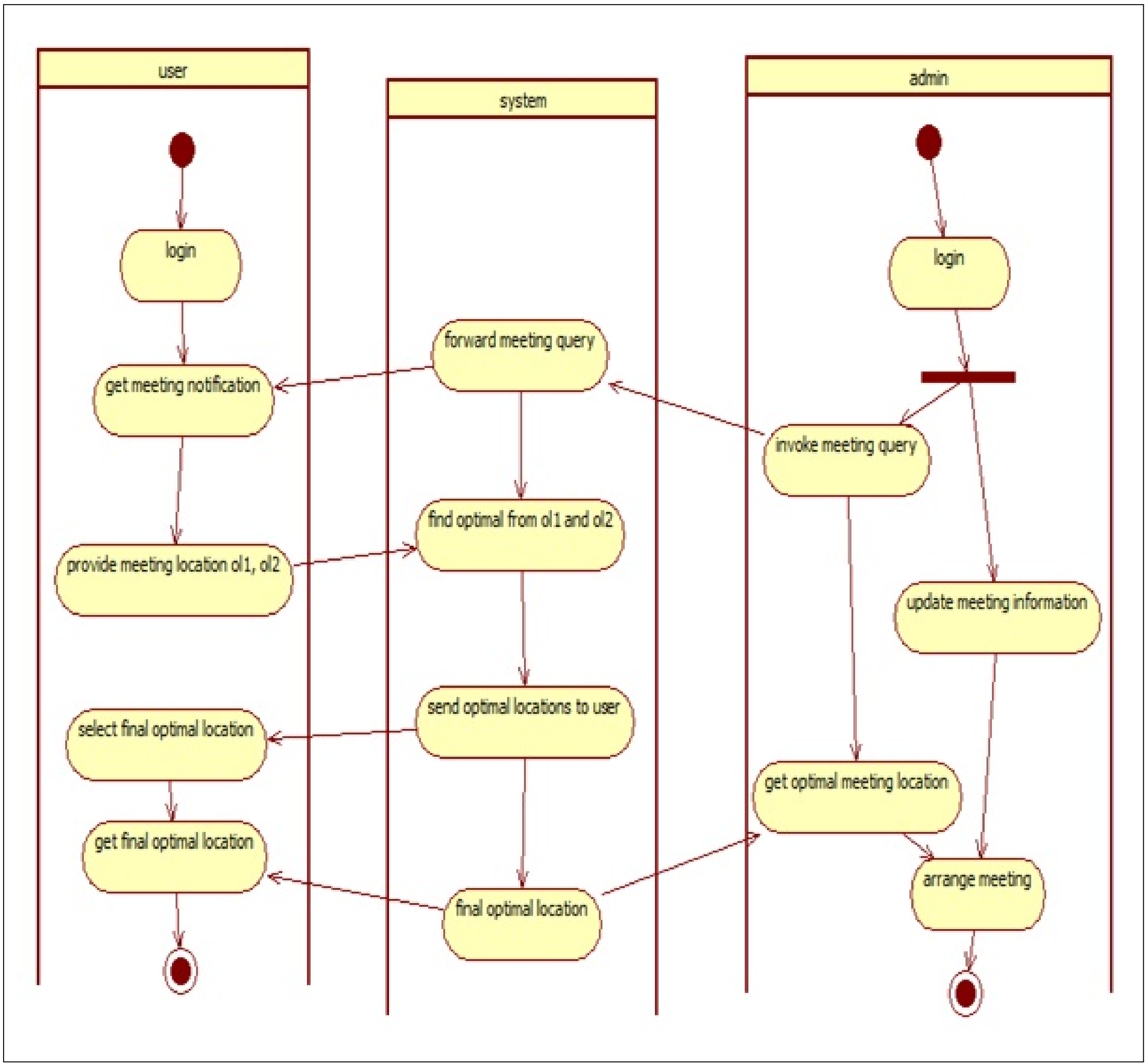

Figure 6.6: Activity diagram

6.4.4 Non Functional Requirements:

- Interface Requirements
- Performance Requirements The project has the following performance requirements:

  - The prime requirement is that no error condition causes a project to exit abruptly.
  - Any error occurred in any process should return an understandable error message.
  - The response should be fairly fast, the action participants should not be confused at any point of time about action that is happening.
  - The system performance is adequate.

- Software quality attributes

  The difference between an amateur product and a carrier grade product is not much in functionality; it is in Quality. For any serious business to depend on a piece of software to continue to function and evolve as needed, a long list of quality attributes or abilities are required. The list seems to be long, but each ability is vital. If you get stuck with something that doesnt have any one of the required abilities, that inability manifests itself in different problematic ways.

6.4.5 Design Constraints

Each user must keep their userid and password as confidential. More over the user must have individual ID for login to the system

6.4.6 Software Interface Description

This system is a multi-user, multi-tasking environment. It enables the user to interact with the server and attain interact with the server by sending the two locations for meeting and also leaves a record in the inbuilt database. It uses java and android as the front end pro- gramming tool and MySQL as the backend application tool.

CHAPTER 7

DETAILED DESIGN DOCUMENT USING APPENDIX A AND B

7.1 INTRODUCTION

In this document we solve the problem of Product.

7.2 ARCHITECTURAL DESIGN

Proposed system will have two algorithms for solving the Fair Rendez-Vous Point (FRVP) problem in a privacy-preserving fashion, where each user participates by providing only a single location preference to the FRVP solver or the service provider.

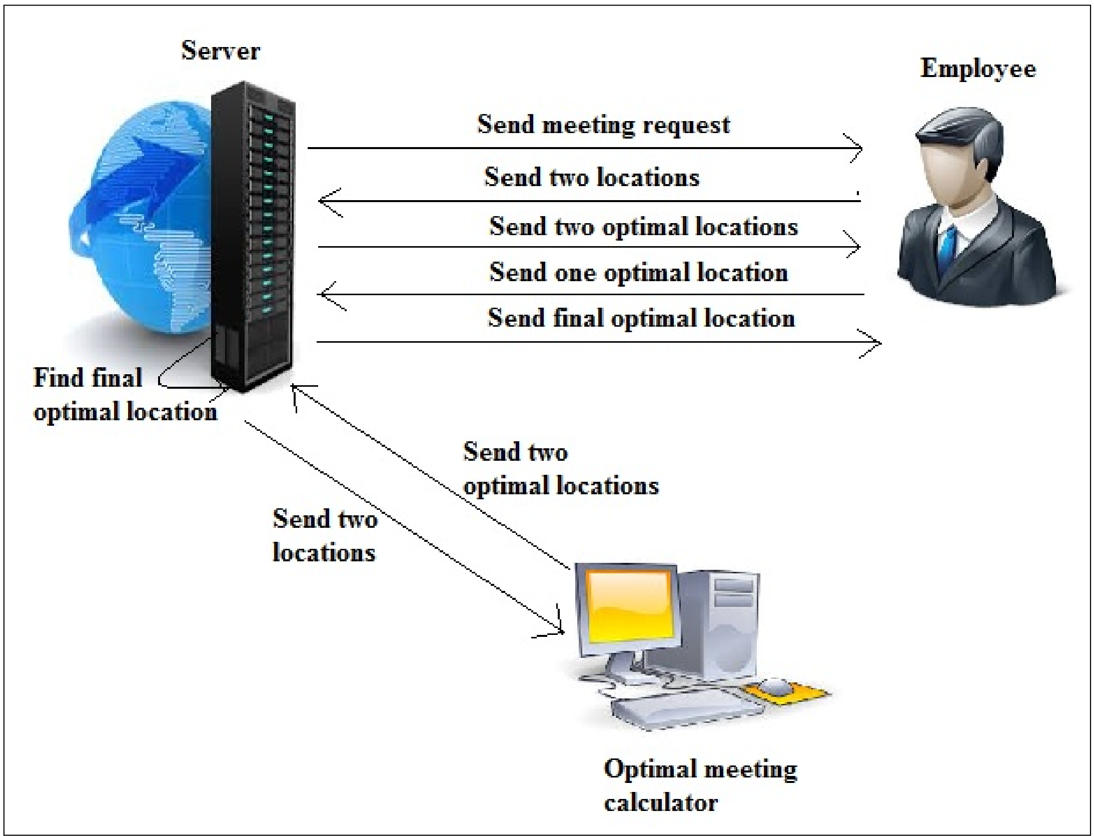

Figure 7.1: Architecture diagram

In addition to the theoretical analysis, we will evaluate the practical efficiency and perfor- mance of the proposed algorithms by means of a prototype implementation on a test bed of mobile devices. It will address the multi-preference case, where each user may have multiple prioritized location preferences.

Goal is to provide practical privacy preserving techniques to solve the FRVP problem, such that neither a third-party, nor participating users, can learn other users locations; partici- pating users only learn the optimal location. The privacy issue in the FRVP problem is representative of the relevant privacy threats in LSBSs.
It addresses the privacy issue in Location-Sharing-Based Services (LSBS) by focusing on a specific problem called the Fair Rendez-Vous Point (FRVP) problem. Given a set of userlocation preferences, the FRVP problem is to determine a location among the proposed ones such that the maximum distance between this location and all other users locations is minimized, i.e. it is fair to all users.
We will first formulate the FRVP problem as an optimization problem, specifically the k- center problem, and then analytically outline the privacy requirements of the participants with respect to each other and with respect to the third-party service provider. We will use two algorithms for solving the above formulation of the FRVP problem in a privacy- preserving fashion, where each user participates by providing only a single location prefer- ence to the FRVP service provider. The proposed algorithms take advantage of the homo- morphic properties of well-known cryptosystems, such as BGN, ElGamal and Paillier, in order to privately compute an optimally fair rendez-vous point from a set of user location preferences.
Apart from that, the multi-preference case, where each user may have multiple prioritized location preferences can be considered.

7.3 DATA DESIGN (USING APPENDICES A AND B)

We are designing this project by using the optimal meeting calculation algorithm. In this algorithm we calculate the optimal location for the meeting. For working all the process the database is very much inportant. WE are maintaining all the details using about user as well as locations by using this dotabse. We are maintaining the tables for storing the different records.

7.3.1 Internal software data structure

Not applicable

7.3.2 Global data structure

Not applicable

7.3.3 Temporary data structure

Not applicable

7.3.4 Database description

Here we are using the MySQL database for maintain the records. In this we are maintain the separate tables for different records. We are using data from one table to another table. In this we are accessing the the data from multiple table at a time using primary key and foreign key.

7.4 COMPOENT DESIGN

Class diagrams, Interaction Diagrams, Algorithms. Description of each component description required.

7.4.1 Class Diagram

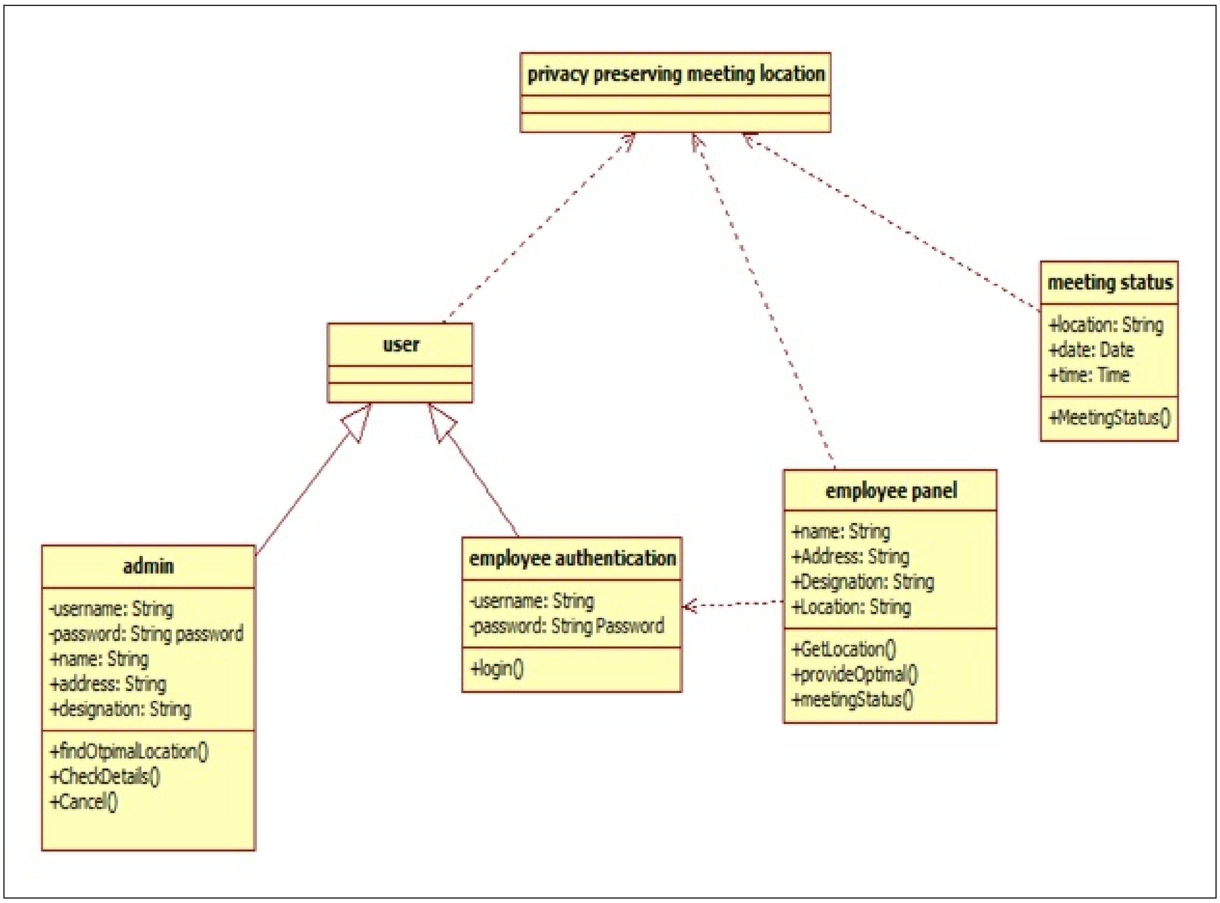

Figure 7.2: Class Diagram

CHAPTER 8

SUMMARY AND CONCLUSION

In this system, we addressed the privacy issue in the Fair Rendez-Vous Problem (FRVP). Our solutions are based on the homomorphic properties of well-known cryptosystems. We designed, implemented and evaluated the performance of our algorithms on real mobile devices. We showed that our solutions preserve user preference privacy and have cceptable performance in a real implementation. Moreover, we extended the proposed algorithms to include cases where users have several prioritized locations preferences. Finally, based on an extensive user-study, we showed that the proposed privacy features are crucial for the adoption of any location haring or location-based applications.

CHAPTER 9

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ANNEXURE A

LABORATORY ASSIGNMENTS ON PROJECT ANALYSIS OF ALGORITHMIC DESIGN

- Optimal Location Calculation:

Steps:

1. For the first location given the values in the list:Lat1, lon1, years1, months1 and days1. Then convert Lat1 and Lon1 from degrees to radians by using,

$$lat1 = lat1 * PI/180$$

$$lon1 = lon1 * PI/180$$

2. Then, convert lat/lon to Cartesian coordinates for first location by using,

$$X1 = cos(lat1) * cos(lon1)$$

$$Y1 = cos(lat1) * sin(lon1)$$

$$Z1 = sin(lat1)$$

3. Then for first location compute weight (by time).

$$w1 = (years1 * 365.25) + (months1 * 30.4375) + days1$$

If locations are to be weighted equally, set w1, w2 etc all equal to 1. 4. Repeat steps 1-3 for all remaining locations in the list.

5. Compute combined total weight for all locations.

$$Totweight = w1 + w2 + ... + wn$$

6. Compute weighted average x, y and z coordinates by using,

$$x = ((x1 * w1) + (x2 * w2) + ... + (xn * wn))/totweight$$

$$y = ((y1 * w1) + (y2 * w2) + ... + (yn * wn))/totweight$$

$$z = ((z1 * w1) + (z2 * w2) + ... + (zn * wn))/totweight$$

7. Convert average x, y, z coordinate to latitude and longitude. Note that in Excel and possibly some other applications, the parameters need to be reversed in the atan2 function, for example, use atan2(X,Y) instead of atan2(Y,X).

$$Lon = atan2(y, x)$$

$$Hyp = sqrt(x * x + y * y)$$

$$Lat = atan2(z, hyp)$$

8. Convert lat and lon to degrees.

$$lat = lat * 180/PI$$

$$lon = lon * 180/PI$$

9. Special case:
If abs(x) ¡ 10-9 and abs(y) ¡ 10-9 and abs(z) ¡ 10-9 then the geographic midpoint is the center of the earth.

ANNEXURE B

LABORATORY ASSIGNMENTS ON PROJECT QUALITY AND RELIABILITY TESTING OF PROJECT DESIGN

It should include assignments such as

- Use of divide and conquer strategies to exploit distributed/parallel/concurrent processing of the above to identify object, morphisms, overloading in functions (if any), and functional relations and any other dependencies (as per requirements). Our system work as a distribute manner. It means that one module is dependant on the another module. The output of previous module is required as a input to the next module. So that before executing previous module we cannot execute the next module.

- Use of above to draw functional dependency graphs and relevant Software modeling methods, techniques including UML diagrams or other necessities using appropriate tools.

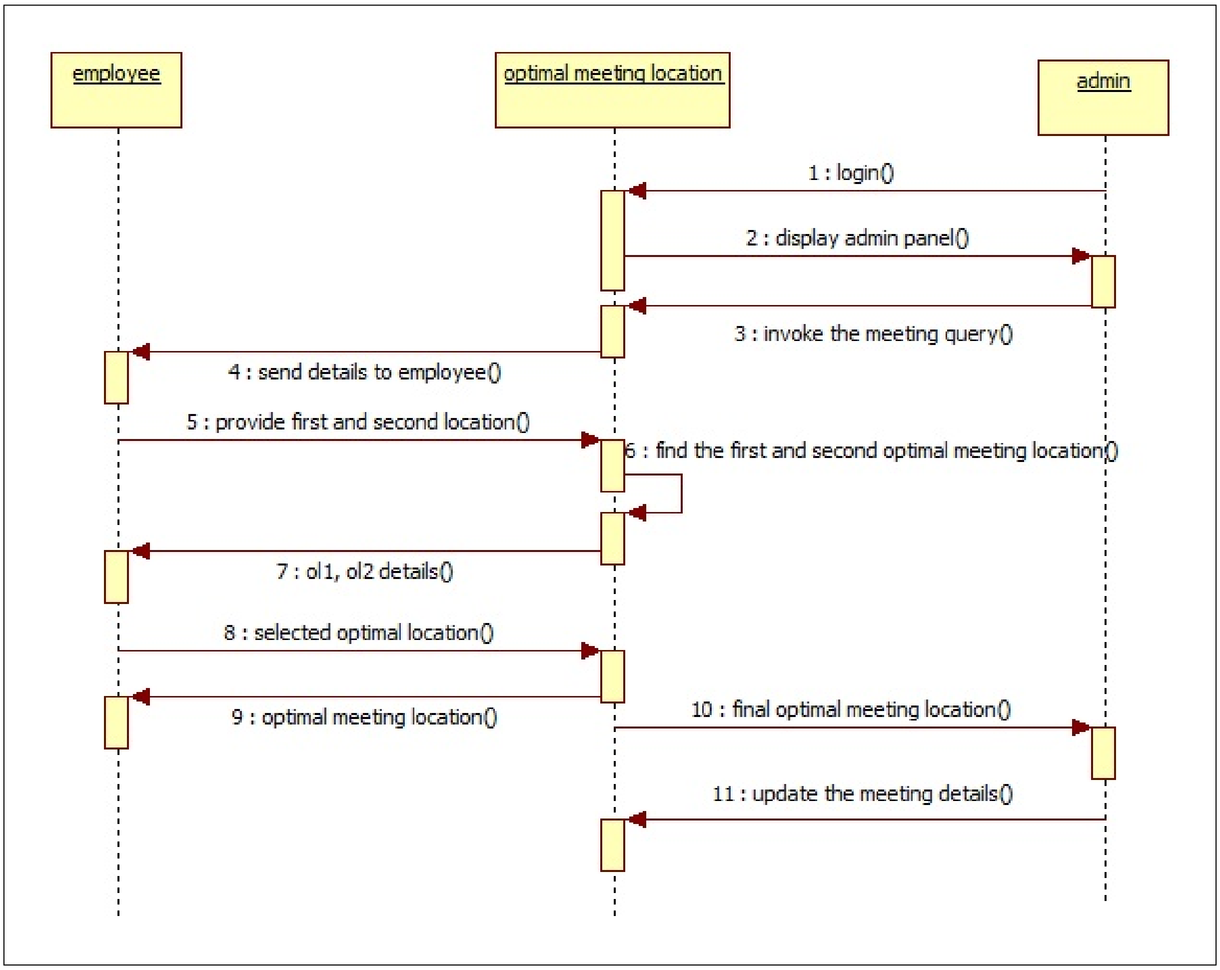

Figure B.1: Sequence Diagram

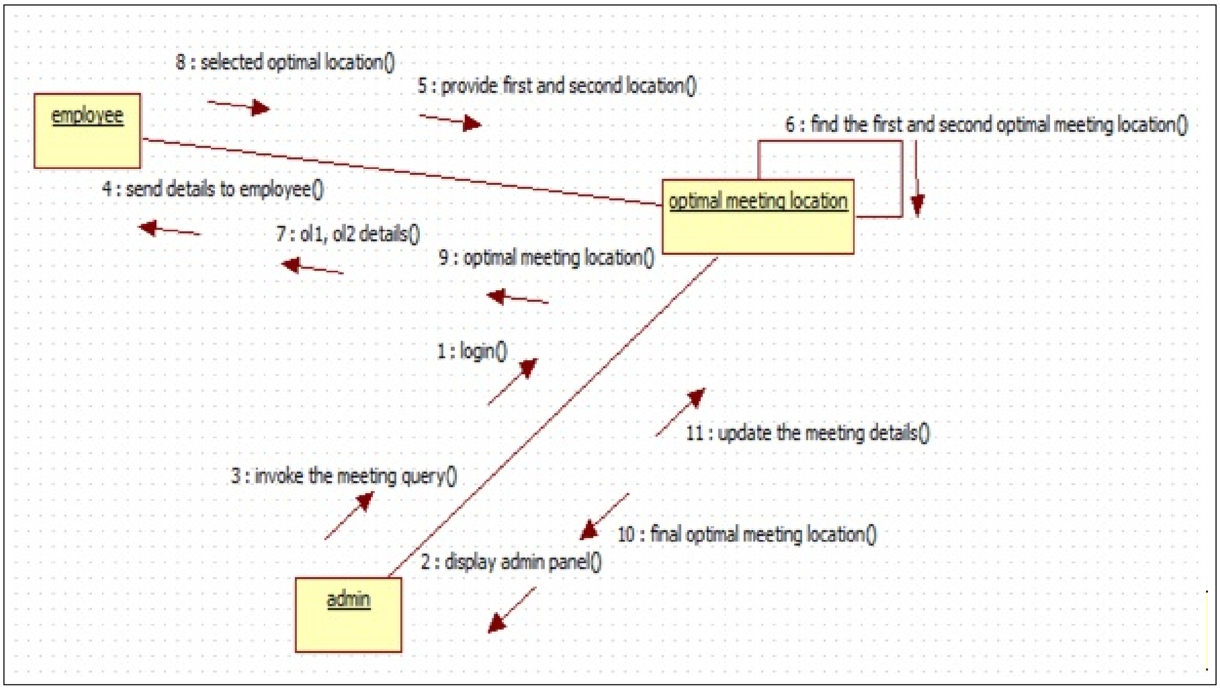

Figure B.2: collaboration Diagram

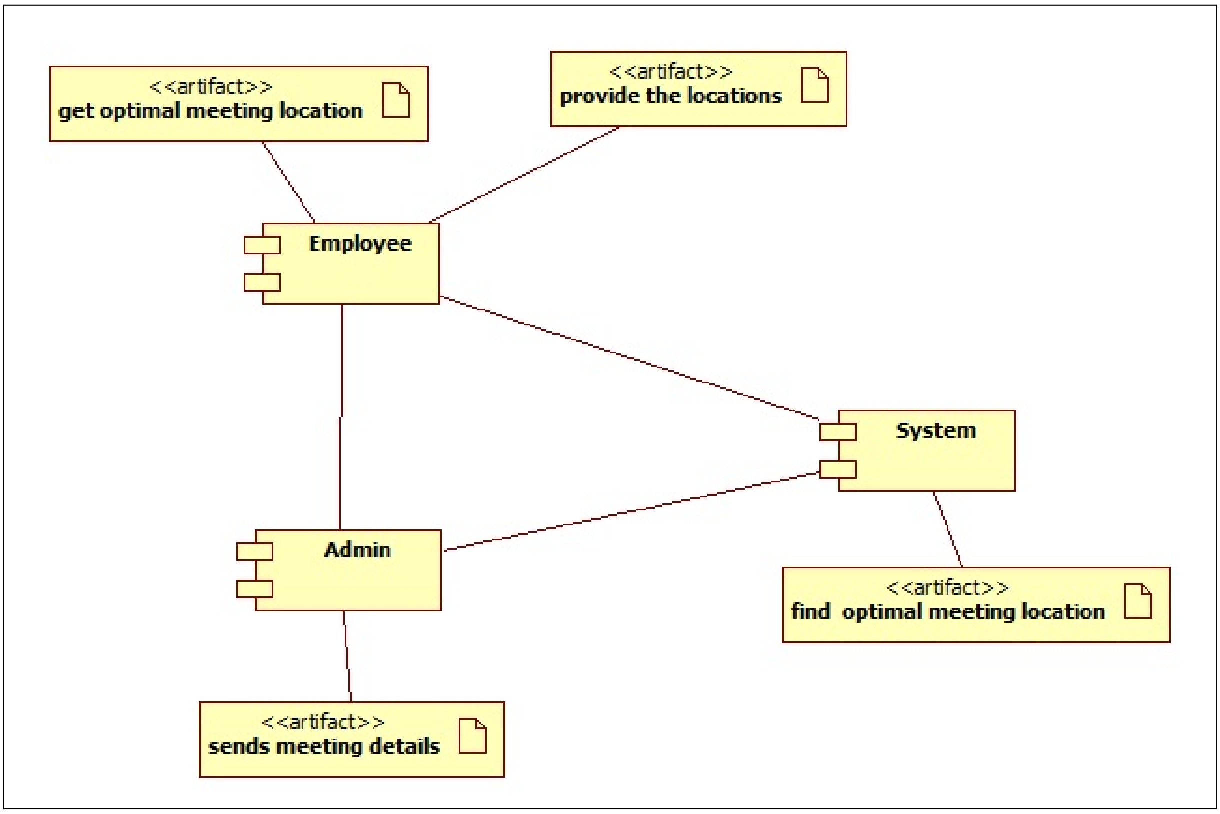

Figure B.3: Component Diagram

ANNEXURE C

PROJECT PLANNER

Project planning emphasizes on following aspects:

Work Breakdown: Load the Work Breakdown Structure data into the planning and scheduling repositories. As the Work Breakdown Structure content is derived, progressively load the data into the planning and scheduling repositories. Generate reports, review the content and progressively update the data. This process continues on an iterative basis.

Hierarchical Tree of activities and outcomes.

Make work statement for each task: The project schedules show the timing and sequence of tasks within a project, as well as the project duration and consists of tasks, dependencies among tasks, durations, constraints, milestones and other time oriented project information. The schedules specify the relative beginning and ending times of activities and their occurrence times. The schedules may be presented on a calendar framework or on an elapsed time scale. For the individual project being planned, the Work Breakdown Structure and task dependencies are used to develop estimates, resource allocations and an initial critical path prior to integrating it with other work - streams and optimizing the overall schedule.

Responsibilities and involvement.

Budget and time estimates: Means that the duration assigned to the task remains fixed whether the resources assigned to the task are increased or decreased. As a result, the change in resources will change the tasks work effort requirement. The selection of the appropriate category depends upon whether the duration of the task can be shortened by assigning more resource to it. Duration is defined as the total span of working time required to complete a task. To estimate project length, the approximate elapsed time for each task is calculated using the formula: Phase or Rolling Wave Planning.

In larger projects, it may be acceptable to consider the entire project at a high level and only perform detailed planning and scheduling for one or two stages of the project at a time. This may result in a more accurate short term view and may save rework in correcting information at a later stage in the light of less uncertainty.This is often referred to as Phase or Rolling Wave Planning.

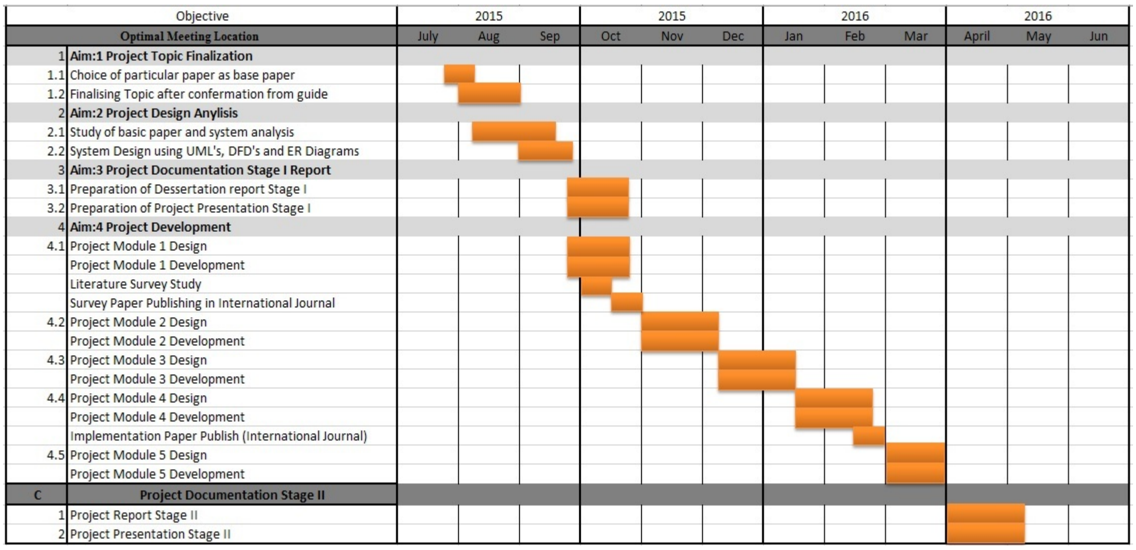

Figure C.1: Planning Procedure

Above figure shows the Plan of Project that will be the basis for the execution and tracking of all the project activities, which is used throughout the life of the project and kept up to date to reflect the actual accomplishments and plans of the project. Requirement Analysis and study part of the project was as follows:

- Understanding the problem definition;
- Understanding the current scenario in Market;
- Gathering information about required Software;
- Gathering information about required Software Resources;
- Preparing preliminary design of overall work flow of project;
- Deciding the modules required for overall execution.

ANNEXURE D

REVIEWERS COMMENTS OF PAPER SUBMITTED

(At-least one technical paper must be submitted in Term-I on the project design in the conferences/workshops in IITs, Central Universities or UoP Conferences or equivalent International Conferences Sponsored by IEEE/ACM)

1. Paper Title:
2. Name of the Conference/Journal where paper submitted :
3. Paper accepted/rejected :
4. Review comments by reviewer :
5. Corrective actions if any :

ANNEXURE E

PLAGIARISM REPORT

Plagiarism report