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A Hidden-Policy Attribute-Based Encryption Approach for Secure Cloud Data Sharing

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Abstract - Data sharing is a convenient and economic service supplied by cloud computing. Data contents privacy also emerges from it since the data is outsourced to some cloud servers. To protect the valuable and sensitive information, various techniques are used to enhance access control on the shared data. In these techniques, Ciphertext-policy attribute-based encryption (CP-ABE) can make it more convenient and secure. Traditional

CP-ABE focuses on data confidentiality merely, while the user's personal privacy protection is an important issue at present. CP-ABE with hidden access policy ensures data confidentiality and guarantees that user's privacy is not revealed as well. However, most of the existing schemes are inefficient in communication overhead and computation cost. Moreover, most of those works take no consideration about authority verification or the problem of privacy leakage in authority verification phase. To tackle the problems mentioned above, a privacy preserving CP-ABE scheme with efficient authority verification. The secret keys of it achieve constant size. Meanwhile, the proposed scheme achieves the selective security under the decisional n-BDHE problem and decisional linear assumption. The computational results confirm the merits of the presented scheme.

1. INTRODUCTION

Cloud computing is widely used by both individuals and organizations (including government agencies), for example to store and process large volume of data (e.g., text, image, and video), which are typically encrypted prior to outsourcing. Searchable Encryption (SE) schemes enable data users to securely search and selectively retrieve records of interest over encrypted data (outsourced to the cloud), according to user- specified keywords. There are, however, other desirable properties when dealing with encrypted data outsourced to the cloud. For example, when encrypting significant volume of data, conventional encryption approaches suffer from limitations due to having multiple copies of ciphertexts (e.g., in public key encryption schemes) and complex and expensive key management (e.g., in symmetric encryption schemes).

Ciphertext-Policy Attribute-Based Encryption (CP-ABE) schemes are designed to mitigate these two limitations, as well as enhancing access permissions in multi-user setting and facilitating one-to-many encryption (rather than one-to-one) CLOUD computing is widely used by both individuals and organizations (including government agencies), for example to store and process large volume of data (e.g., text, image, and video), which are typically encrypted prior to outsourcing. Searchable Encryption (SE) schemes enable data users to securely search and selectively retrieve records of interest over encrypted data (outsourced to the cloud), according to user- specified keywords.

Cloud techniques make it possible to utilize information technology resources into business domain. The cloud provides variety of scalable services on-demand, such as online databases, program interface, storage and computing resources, etc. Users can obtain services through phones, laptops, and desktops.It is also helpful in data analyzing and computing, which is quite simple as it can provide a variety of services at the same time. Cloud has many advantages in data storage, such as decreasing communication cost and maintenance charge, allowing remote access, and so on.
It provides so many benefits because of the data confidentiality and privacy problems. The cloud server (CS) may be untrusted, in other words, if data is uploaded to cloud, the cloud service provider may obtain and disclose users' personal privacy, and even access and share the data illegally .

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To make sure the confidentiality of the data in cloud, people are inclined to encrypt them before they are uploaded to cloud. But the general encryption algorithms make the data process become difficult. ABE is a good candidate to overcome this limitation. The data confidentiality and provided the fine- grained access control policy to the customers. It has been widely accepted as an effective method encrypting the outsourced data in cloud computing. ABE improves the efficiency when the data owner (DO) intends to share data contents with multiusers. It permits DO to specify an access policy to the encrypted files, which can make the users who match it, access uploaded data. The users who do not satisfy the access structure cannot get any information about the data contents. For instance, we consider the data access control for a company. If the CEO intends to submit a classified file, through the cloud, to the managers in sales department, planning department, and research and development (R&D) department. Then he/she can use an ABE scheme. First he/she encrypts the file and specifies an access structure as ω = manager ∧ (sales department V planning department ∨ R&D). Next he/she uploads the encrypted file and the access structure into the CS. Only the managers in the three mentioned departments can access the classified file, and the managers in other departments or the general staff in the three mentioned departments cannot learn anything about the file even if they collude.

Most of ABE proposals perform very well in secure data sharing. However, the personal privacy of the DO and the users is ignored in these constructions. For convenience of recovering data, the access policy is always sent with ciphertexts. In some scenarios, the access structure may carry sensitive information of users.

1.1 PURPOSE

The purpose of improving security and privacy attribute-based data sharing in cloud computing is to address the challenges associated with securely sharing sensitive data in cloud environments while ensuring compliance with privacy regulations and organizational policies. This system aims to enhance security measures and privacy protections by implementing attribute-based access control (ABAC) mechanisms, which allow data owners to define access policies based on specific attributes of users and data. By improving the security and privacy of data sharing in cloud computing, this system aims to foster trust among users and organizations, promote data confidentiality, and mitigate the risk of unauthorized access or data breaches.

1.2 SCOPE

The scope of the system for improving security and privacy attribute-based data sharing in cloud computing encompasses various aspects related to access control, encryption, and privacy-preserving techniques. This includes the development of ABAC models and policies for defining fine-grained access controls based on user attributes such as roles, permissions, or other contextual factors. Additionally, the system may involve the integration of encryption mechanisms to protect data confidentiality during transmission and storage in the cloud. Furthermore, considerations for auditability, scalability, and interoperability across different cloud platforms and data sharing scenarios are essential aspects of the system's scope.

1.3 NEED FOR SYSTEM

Data Protection: Cloud computing environments often host large volumes of sensitive data, including personal, financial, and proprietary information. Enhancing security and privacy measures is essential to protect this data from unauthorized access, data breaches, and privacy violations.

Compliance Requirements: Organizations are subject to various regulatory requirements and industry standards, such as the General Data Protection Regulation (GDPR) or the Health Insurance Portability and Accountability Act (HIPAA), which mandate the protection of sensitive data and user privacy.

Trust and Confidence: Ensuring the security and privacy of data sharing in cloud environments is crucial for building trust and confidence among users, customers, and stakeholders. By implementing effective security measures and privacy protections, organizations can demonstrate their commitment to safeguarding sensitive information and preserving user privacy.

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Risk Mitigation: Unauthorized access to sensitive data can have severe consequences, including financial losses, reputational damage, and legal liabilities. Improving security and privacy attribute-based data sharing helps mitigate the risk of data breaches and unauthorized access, reducing the likelihood of adverse impacts on organizations and individuals.

The development of a system for improving security and privacy attribute- based data sharing in cloud computing addresses the pressing need for robust security measures and privacy protections in cloud environments. By implementing advanced access control, encryption, and privacy-preserving techniques, organizations can enhance data protection, achieve regulatory compliance, foster trust, and mitigate the risk of data breaches and privacy violations in cloud computing environments.

1.3.1 EXISTING SYSTEM

Old Systems designed to support unshared multi-owner setting, and cannot be directly applied in the shared multi-owner setting.As existing system does not provides server data for which multi-keyword and multi owner search.It is difficult to identify malicious users who leak the secret keys when more than one data user has the same subset of attributes.

Dis-Advantages:

- Existing System provides only Single Owner Sharing.
- Existing System takes higher time for getting results from server.
- Privacy issues are raised in submission of query.
- Repeatedly send the query, user feel like complex.
- In the existing work, while CPABKS schemes can achieve one-to- many encryption and support expressive access control.
- Not capable of identifying data users leaking the secret keys if the ‘culprits’ have the same subset of attributes as other honest data users.
- Data Leak sensitive information cannot be controlled.

1.3.2 PROPOSED SYSTEM

A framework of HP-CP-ABE with efficient authority identification is proposed, which guarantees the data confidentiality and protects the user personal privacy as well.In order to avoid unnecessary computations of users in decryption algorithm, we design an authority identification method, which can help the user verify whether he/she is an authorized one and decrypts successfully.The proposed scheme achieves constant private key size, which is independent of user’s attribute number. It reduces the cost of transmission and storage. In addition, a compact security analysis by using a sequence of hybrid games is given to show the proposed scheme of how to achieve anonymity, which is lacking in most of the existing works.

Advantages:

- Data confidentiality
- Privacy preserving
- Efficient decryption test
- Efficiency, such as parameters size and time consumption of algorithms.

2. SOFTWARE REQUIREMENT ANALYSIS AND SPECIFICATION

2.1 RELATED WORK

The concept of Cloud Computing to achieve a complete definition of what a Cloud is, using the main characteristics typically associated with this paradigm in the literature. More than 20 definitions have been studied allowing for the extraction of a

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consensus definition as well as a minimum definition containing the essential characteristics, much attention to the Grid paradigm, as it is often confused with Cloud technologies. We also describe the relationships and distinctions between the Grid and Cloud approaches.

2.1.1 LITERATURE SURVEY

[1] X. Yu and Q. Wen, "Design of security solution to mobile cloud storage," in Knowledge Discovery and Data Mining. New York, NY, USA: Springer, 2012, pp. 255–263

NTT provides cloud security and visibility to your whole estate, including network, infrastructure and cloud apps. Our capabilities include a powerful combination of security, automation, and observability in a single cloud-native platform, greatly influencing the speed and quality of your business outcomes. The cloud-to-edge platform features analytic dashboards to quickly monitor the security health across your technology stacks. The outcome? A more resilient business. That's cloud done right.

[2] D. Huang, "Mobile cloud computing," IEEE COMSOC Multimedia Commun. Techn. Committee E-Letter, vol. 6, no. 10, pp. 27–31, 2011.

Cloud computing has proliferated as a new computation and resource provisioning paradigm in today's Internet. Featured by its on-demand, scalable resource provision, cloud computing has been exploited for a wide range of multimedia applications, including adaptive and energy- efficient multimedia computing, storage and transmission, both to the Internet users and mobile users. This special issue of ELetter focuses on the recent progresses of cloud-based multimedia computing, storage and transmission algorithms and systems. We are very glad to introduce five interesting papers in this topic area, from leading research groups around the world, to report their latest solutions and results.

2.1.2 EXISTING ALGORITHMS/TECHNIQUES

The volume of worldwide digital content has increased nine-fold within the last five years, and this immense growth is predicted to continue in foreseeable future reaching 8ZB already by 2015. Traditionally, in order to cope with the growing demand for storage capacity, organizations proactively built and managed their private storage facilities. Recently, with the proliferation of public cloud infrastructure offerings, many organizations, instead, welcomed the alternative of outsourcing their storage needs to the providers of public cloud storage services. The comparative cost-efficiency of these two alternatives depends on a number of factors, among which are e.g. the prices of the public and private storage, the charging and the storage acquisition intervals, and the predictability of the demand for storage. In this paper, we study how the cost-efficiency of the private vs. public storage depends on the acquisition interval at which the organization re-assesses its storage needs and acquires additional private storage. The analysis in the paper suggests that the shorter the acquisition interval, the more likely it is that the private storage solution is less expensive as compared with the public cloud infrastructure. This phenomenon is also illustrated in the paper numerically using the storage needs encountered by a university back-up and archiving service as an example. Since the acquisition interval is determined by the organization's ability to foresee the growth of storage demand, by the provisioning schedules of storage equipment providers, and by internal practices of the organization, among other factors, the organization owning a private storage solution may want to control some of these factors in order to attain a shorter acquisition interval and thus make the private storage (more) cost-efficient.

Modern mobile devices continue to approach the capabilities and extensibility of standard desktop PCs. Unfortunately, these devices are also beginning to face many of the same security threats as desktops. Currently, mobile security solutions mirror the traditional desktop model in which they run detection services on the device. This approach is complex and resource intensive in both computation and power. A new model whereby mobile antivirus functionality is moved to an off-device network service employing multiple virtualized malware detection engines. Our argument is that it is possible to spend bandwidth resources to significantly reduce on- device CPU, memory, and power resources. We demonstrate how our in-cloud model enhances mobile security and reduces on-device software complexity, while allowing for new services such as platform-specific behavioral analysis engines. Our benchmarks on Nokia's N800 and N95 mobile devices show that our mobile agent consumes an order of magnitude less CPU and memory while also consuming less power in common scenarios compared to existing on- device antivirus software.

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2.2 RESEARCH METHODOLOGY

2.2.1 SYSTEM ARCHITECTURE

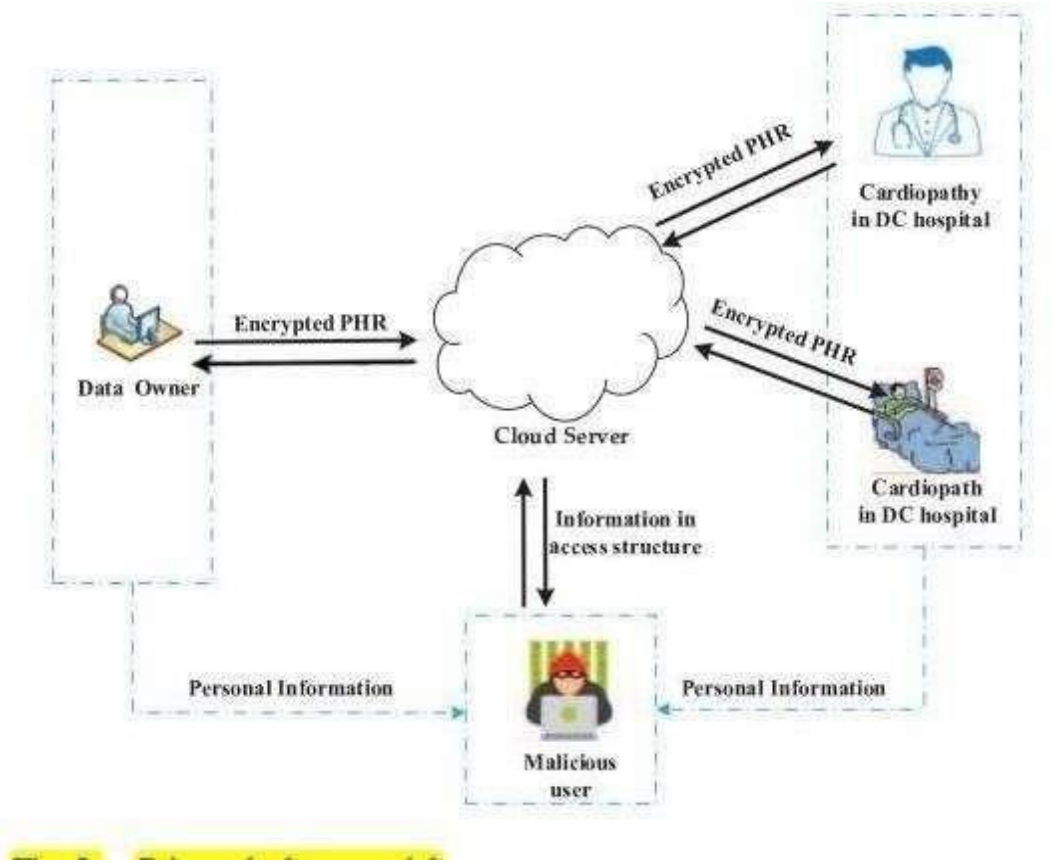

Fig.no.2.2.1.1: System Architecture

2.2.2 PROPOSED ALGORITHMS/TECHNIQUES

Step 1: Data Encryption:

Encrypt(Data, Key):

{

EncryptedData = Symmetric_Encryption(Data, Key) return EncryptedData
}
Decrypt(EncryptedData, Key):

{

Data = Symmetric_Decryption(EncryptedData, Key) return Data
}

Description: Data encryption is the process of converting plaintext (readable data) into ciphertext (unreadable data) to protect it from unauthorized access. It involves using an encryption algorithm and a secret key to transform the data into an unreadable format.

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Step 2: Attribute-Based Access Control (ABAC):

a. Define attributes associated with data and users.

b. Implement a policy enforcement mechanism based on attributes.

c. Allow access to data only if the user's attributes match the access policy.

Description: Attribute-Based Access Control (ABAC) is a security model that grants access to resources based on a user's attributes, rather than their role or identity. In ABAC, access decisions are made by evaluating a set of attributes associated with the user, the resource, and the environment.

Step 3: Data Anonymization:

Description: Remove or obfuscate identifying information from the Data. Replace sensitive attributes with anonymized values. Ensure that anonymization preserves data utility for authorized users.

Step 4: Secure Data Transmission:

a. Use secure communication protocols (e.g., HTTPS) for data

transmission.

a. Encrypt data during transmission to prevent interception.

Description: Secure data transmission refers to the process of transferring data from one location to another while protecting it from unauthorized access, interception, or tampering. This is achieved through the use of various security measures and protocols that ensure the confidentiality, integrity, and authenticity of the data being transmitted.

Step 5: Secure Key Management:

a. Generate and manage encryption keys securely.

b. Use key encryption keys (KEKs) to encrypt data encryption keys (DEKs).

c. Implement access controls and audit trails for key management

operations.

Description: Secure key management refers to the process of generating, distributing, storing, using, and revoking cryptographic keys in a secure and controlled manner. The goal of secure key management is to protect the confidentiality, integrity, and authenticity of the data being encrypted, as well as to prevent unauthorized access to the encrypted data.

Step 6: Privacy-Preserving Data Sharing:

Description: Use techniques such as secure multi-party computation (SMPC) for collaborative analysis without revealing sensitive data. Implement differential privacy mechanisms to protect individual privacy in aggregate data analysis.

2.3 PROPOSED MODULES

Cloud Server Module:
The Cloud user module is developed such that the new users will Signup initially and then Login for authentication. The Cloud user is provided with the option of file search. Then cloud user feature is added up for send the Request to Key Manager for the File access. After getting decrypt key from the Auditor, he/she can access to the File. The cloud user is also enabled to download the File. After completion of the process, the user logout the session.
Key Manager Module:

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Will Login on the key Manager page. He/she will check the pending requests of any User. After accepting the request from the User, he/she will generate master key for encrypt and Secret key for decrypt. After the complete process, the Key manager logout the session.

Data Provider Module:

The Data Provider module is developed such that the new users will Signup initially and then Login for authentication. The Data Provider module provides the option of uploading the file to the Cloud Server using Identity-Based Encryption. Data Provider is provided with the feature of Revocation and Ciphertext update of the file. Once after completion of this process, the Data Provider logsout of the session.

Data User:

In this module, the receiver can receive the data file from the service provider via Base station. The receivers receive the file by without changing the File Contents. Users may receive particular data files within the network only.

2.4 USER CONSTRAINTS

User Constraints for project is analyzed in this phase and business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis the feasibility study of the proposed system is to be carried out. This is to ensure that the proposed system is not a burden to the company. For feasibility analysis, some understanding of the major requirements for the system is essential.

Three keyconsiderations involved in the feasibility analysis are

- ECONOMICAL CONSTRAINTS
- TECHNICAL CONSTRAINTS
- SOCIAL CONSTRAINTS

ECONOMICAL CONSTRAINTS

This study is carried out to check the economic impact that the system will have on the organization. The amount of fund that the company can pour into the research and development of the system is limited. The expenditures must be justified. Thus the developed system as well within the budget and this was achieved because most of the technologies used are freely available. Only the customized products had to be purchased.

TECHNICAL CONSTRAINTS

This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand on the available technical resources. This will lead to high demands on the available technical resources. This will lead to high demands being placed on the client. The developed system must have a modest requirement, as only minimal or null changes are required for implementing this system.

SOCIAL CONSTRAINTS

The aspect of study is to check the level of acceptance of the system by the user. This includes the process of training the user to use the system efficiently. The user must not feel threatened by the system, instead must accept it as a necessity. The level of acceptance by the users solely depends on the methods that are employed to educate the user about the system and to make him familiar with it. His level of confidence must be raised so that he is also able to make some constructive criticism, which is welcomed, as he is the final user of the system.

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2.5 HARDWARE REQUIREMENTS

- Processor : I3 or higher
- Speed : 2.9 GHz
- RAM : 4 GB (min)
- Hard Disk : 160 GB

2.6 SOFTWARE REQUIREMENTS

- Operating system : Windows 7 Ultimate
- Coding Language : Java
- Front-End : JSP
- Back-End : MySQL
- Designing : Html, CSS, JavaScript

FUNCTIONAL REQUIREMENTS

Functional requirements describe what the system should do. The functional requirements can be further categorized as follows:

- What inputs the system should accept?
- What outputs the system should produce?
- What data the system must store?
- What are the computations to be done?

The input design is the link between the information system and the user. It comprises the developing specification and procedures for data preparation and the steps are necessary to put transaction data in to a usable form for processing that can be achieved by inspecting the computer to read data from a written or printed document or it can occur by having people keying the data directly into the system. The design of input focuses on controlling the amount of input required, controlling the errors, avoiding delay, avoiding extra steps and keeping the process simple. The input is designed in such a way so that it provides security and ease of use with retaining the privacy. Input Design considered the following things:

1. What data should be given as input?
2. How the data should be arranged or coded?
3. The dialog to guide the operating personnel in providing input.
4. Methods for preparing input validations and steps to follow when error occur.

2.7 NON-FUNCTIONAL REQUIREMENTS

Non-Functional Requirement (NFR) specifies the quality attribute of a software system. They judge the software system based on Responsiveness, Usability, Security, Portability and other non- functional standards that are critical to the success of the software system. Example of nonfunctional requirement, “how fast does the website load?” Failing to meet non- functional requirements can result in systems that fail to satisfy user needs. Non- functional Requirements allows you to impose constraints or restrictions on the design of the system across the various agile backlogs. Example, the site should load in 3 seconds when the number of simultaneous users are> 10000. Description of non-functional requirements is just as critical as a functional requirement.

- Usability requirement
- Serviceability requirement

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- Manageability requirement
- Recoverability requirement
- Security requirement
- Data Integrity requirement
- Capacity requirement
- Availability requirement
- Interoperability requirement
- Reliability requirement
- Maintainability requirement
- Regulatory requirement
- Environmental requirement

Non-functional requirements describe user-visible aspects of the system that are not directly related to functionality of the system. Non- functional requirements these are constraints on the services or functions offered by the System.Non-functional requirements are often called qualities of a system. Other terms for non-functional requirements are "constraints", "quality attributes", "quality goals", "quality of service requirements" and "non- behavioral requirements".

Qualities, that are non-functional requirements, can be divided into two main categories.

Execution qualities, such as security and usability, which are observable at run time.Evolution qualities, such as testability,maintainability, extensibility and scalability, which are embodied in the static structure of the software system.

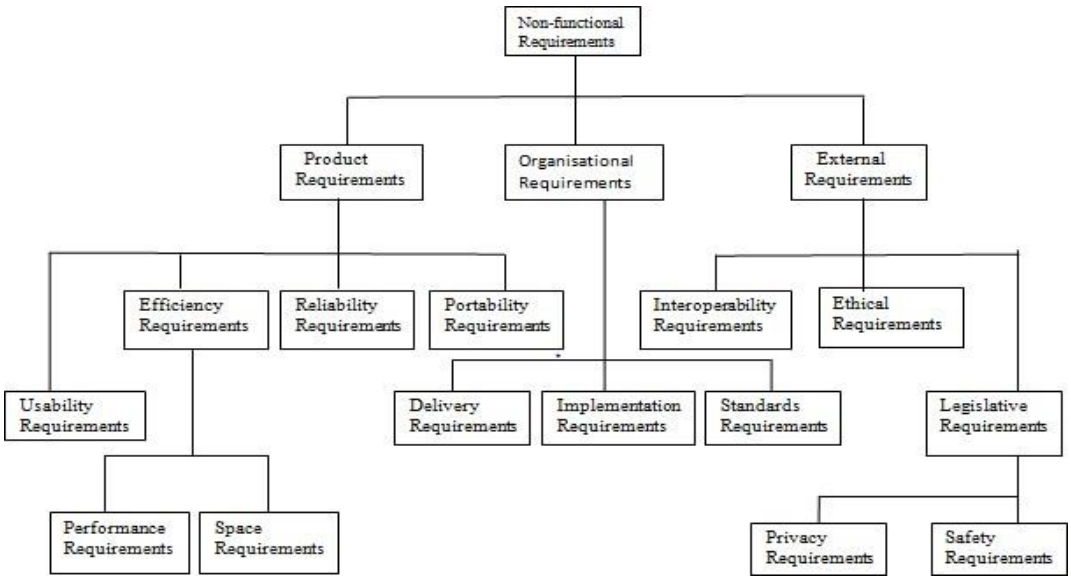

Fig.no.2.7.1: Non-Functional Requirements Usability

- As it is an Internet Application, must have some usabilty Features. End users of this System are Unlimited and from Various Skilled groups, so that we can't restrict them. By providing some facilities we have to make them comfortable.
- Colors what we use in this Web Portal design must be attractive.
- Easy Navigations are Preferable to do any task.

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- Home page Should be Centralized System (Screen/Window) to go to any feature and to get any result.
- The facility to return to Home page from any page Should available.

- Labels of all Objects in the entire system Must be in Understanded.

Serviceability requirement

Serviceability requirements refer to the specific criteria or standards that a product or system must meet to ensure it can be maintained, repaired, or serviced effectively throughout its lifecycle. These requirements are important to ensure that the product can be kept in good working condition, address any issues or failures that may arise, and minimize downtime or disruptions.

Manageability requirement

Manageability requirements refer to the specific criteria or capabilities that a system or software application should possess to facilitate its efficient management, administration, and monitoring. These requirements are essential for ensuring that the system can be effectively controlled, configured, and maintained by administrators or operators.

Recoverability requirement

Recoverability requirements refer to the specific criteria or capabilities that a system or software application should possess to enable the recovery of data, services, or functionality in the event of a failure, error, or disaster. These requirements are essential for ensuring that the system can be restored to a functional state with minimal downtime and data loss.

Security requirement

The web server and database server should be protected from hacking, virus etc.

Data integrity requirement

Data integrity requirements refer to the criteria or measures that must be implemented to ensure the accuracy, consistency, and reliability of data within a system or database. These requirements are crucial for maintaining data quality, preventing unauthorized modifications or corruption, and enabling trust in the information stored or processed by the system.

Capacity requirement

Capacity requirements refer to the specific criteria or capabilities that a system or infrastructure must possess to handle anticipated workloads, data volumes, or user demands within acceptable performance parameters. These requirements are essential for ensuring that the system can effectively support the required scale and growth.

Availability requirement

The system is implemented based on the web browser and server. Using this web browser the user can access the data and store the data in the server; here we can use the web browser as Mozilla and server as Tomcat.

Scalability requirement

Scalability requirements refer to the specific criteria or capabilities that a system or infrastructure must possess to accommodate increasing workloads, data volumes, or user demands without experiencing significant degradation in performance or resource constraints. Scalability is essential for ensuring that the system can grow and adapt to changing requirements, allowing it to handle increased workloads or accommodate additional users without compromising performance or stability.

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Interoperability requirement

Interoperability requirements refer to the specific criteria or capabilities that a system or software application must possess to interact, communicate, and exchange data effectively with other systems, software components, or external entities. Interoperability is essential for seamless integration and collaboration between different systems or components, allowing them to work together efficiently and share information without compatibility issues or data loss.

Reliability requirement

Reliability requirements refer to the specific criteria or characteristics that a system or software application must possess to consistently perform its intended functions without failure or interruption. Reliability is crucial for ensuring that the systems .

Maintainability requirement

The first tier is the GUI, which is said to be front-end and the second tier is the database, which uses MYSQL, which is the back-end. The front- end can be run on different systems (clients).

Regulatory requirement

Regulatory requirements refer to the specific criteria or obligations that a system, software application, or organization must comply with based on legal, industry, or government regulations. These requirements are designed to ensure that systems or organizations operate in accordance with applicable laws, standards, and guidelines to protect users, consumers, and stakeholders, as well as to maintain ethical and legal standards.

SDLC Methodologies

SDLC stands for Software Development Life Cycle. A Software Development Life Cycle is essentially a series of steps, or phases, that provide a model for the development and lifecycle management of an application or piece of software. The intent of a SDLC process it to help produce a product that is cost-efficient, effective, and of high quality.
The SDLCmethodology usually contains the following stages:

1. Requirement Gathering
2. System Design
3. Implementation
4. Testing
5. Deployment
6. Maintenance

SDLC stands for Software Development Life Cycle. A Software Development Life Cycle is essentially a series of steps, or phases, that provide a model for the development and lifecycle management of an application or piece of software. The methodology within the SDLC process can vary across industries and organizations, but standards such as ISO/IEC 12207 represent processes that establish a lifecycle for software, and provide a mode for the development, acquisition, and configuration of software systems. SDLC consists of following activities: The sequential phases in Waterfall model are:

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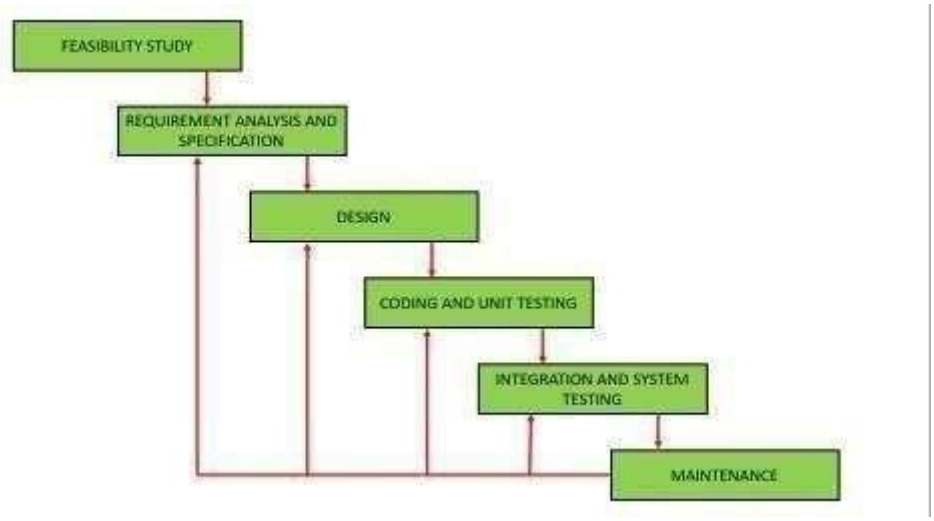

Fig.no:2.7.2:Water fall Model Requirement Gathering and analysis:

All possible requirements of the systemto be developed are captured in this phase and documented in a requirement specification .

System Design:

The requirement specifications from first phase are studied in this phase and system design is prepared. System Design helps in specifying hardware and system requirements and also helps in defining overall system architecture.

Implementation:

With inputs from system design, the system is first developed in small programs called units, which are integrated in the next phase.Each unit is developed and tested for its functionality which is referred to as UnitTesting.

Integration and Testing:

All the units developed in the implementation phase are integrated into a system after testing of each unit. Post integration the entiresystem is tested for any faults and failures.

Deployment of system:

Once the functional and non-functional testing is done, the product is deployed in the customer environment or released into the market.

Maintenance:

There are some issues which come up in the client environment. To fix those issues patches are released. Also to enhance the product some better versions are released. Maintenance is done to deliver these changes in the customer environment.

Advantages:

- The waterfall model is a simple model.
- It is easily understood as all the phases are done step by step.
- No complexity as deliverables of each phase are well defined.

Disadvantages:

- This model cannot be used for the Project wherein the requirement is not.
- Clear or the requirement keeps on changing.
- A working model can only be available once the software reaches at last stage of the cycle.
- It is a time-consuming model.

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3. SYSTEM DESIGN

System design can be viewed from either technical or project management perspective. From the technical point of view, design is comprised of four activities like architectural design, data structure design, interface design and procedural design.

3.1 Database Design (E-R Diagram)

An Entity-Relationship (ER) model illustrates the structure of a database using a visual representation known as an Entity-Relationship Diagram (ER Diagram). This model serves as a blueprint for designing the database schema and capturing the relationships between different entities and attributes.

The ER model provides a systematic approach to organizing and conceptualizing the data within a database system. It represents entities as well as the relationships between them, helping to clarify how data elements are connected and organized.

DATAFLOWDIAGRAM

1. The DFD is also called as bubble chart. It is a simple graphical formalism that can be used to represent a system in terms of input data to the system, various processing carried out on this data, and the output data is generated by this system.
2. The data flow diagram (DFD) is one of the most important modeling tools. It is used to model the system components. These components are the system process, the data used by the process, an external entity that interacts with the system and the information flows in the system.
3. DFD shows how the information moves through the system and how it is modified by a series of transformations. It is a graphical technique that depicts information flow and the transformations that are applied as data moves from input to output.
4. DFD is also known as bubble chart. A DFD may be used to represent a system at any level of abstraction. DFD may be partitioned into levels that represent increasing information flow and functional detail.

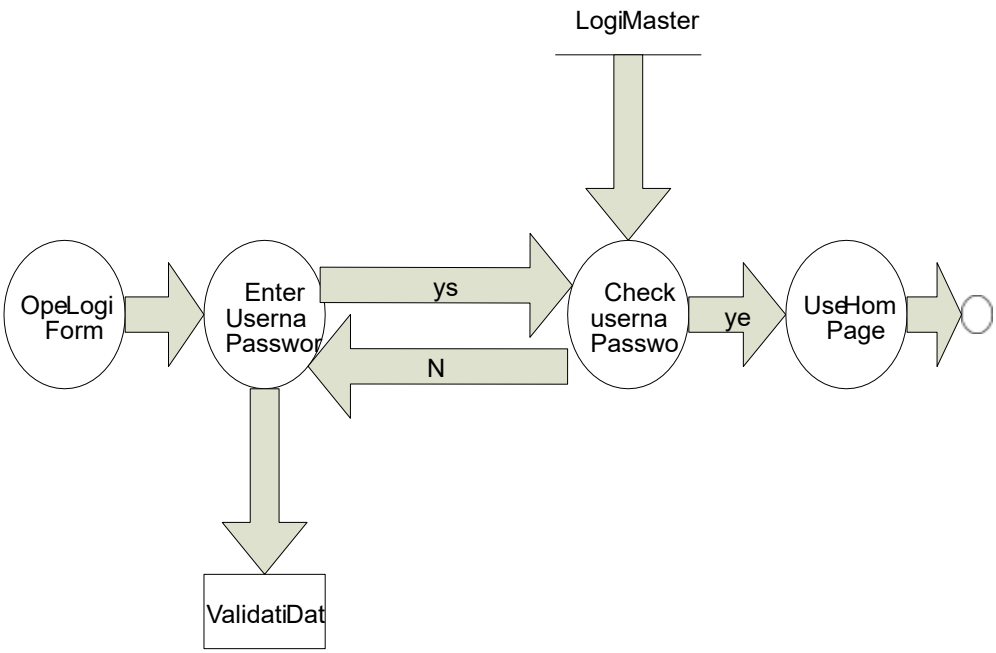

Fig.no.3.1.1: Data Flow Diagram

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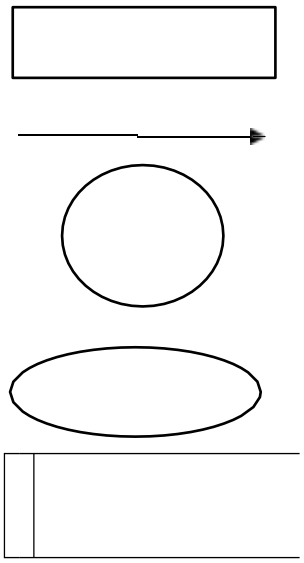
DEFINITION



Define source and destination data.

Shows path of the data flow.

To represent a process that transforms Or Modifies Data

To represent an attribute

Data Store

3.1.1 ER Model

1. The Emergency Room model corresponds to an Entity-Relationship model, serving as a high-level representation of data structures. It is utilized to illustrate the data components and relationships within a defined system.
2. It establishes a structured framework for the database. Moreover, it provides a straightforward and easily understandable perspective on the data.
3. In Entity-Relationship modeling, the organizational database structure is depicted through a design known as an Entity-Relationship diagram.
4. For instance, consider designing a school database. An educational record could be represented as an entity with attributes such as name, ID, age, etc. Similarly, the address could be another entity with attributes like city, street name, zip code, etc., and there would be a relationship between them.

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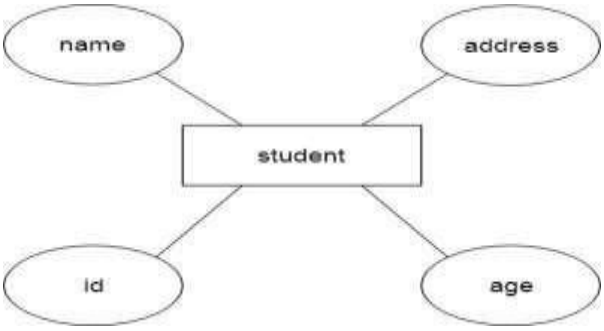
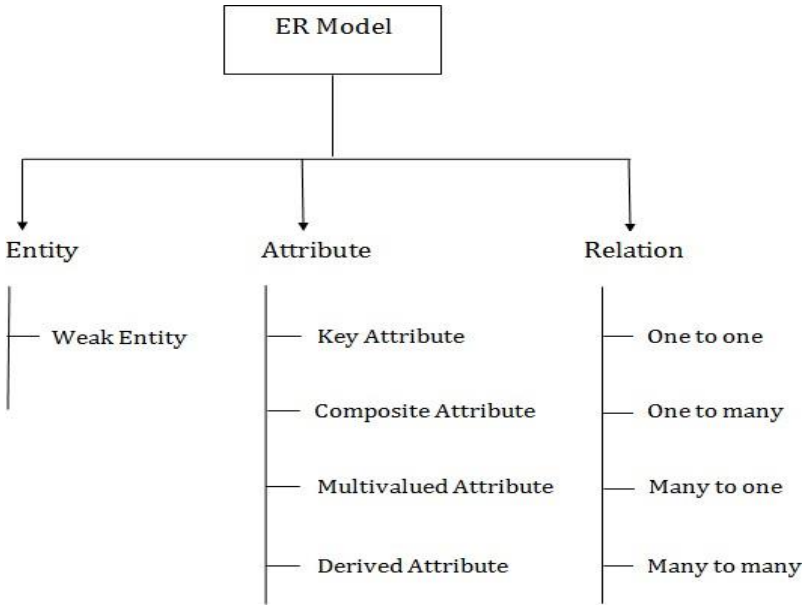


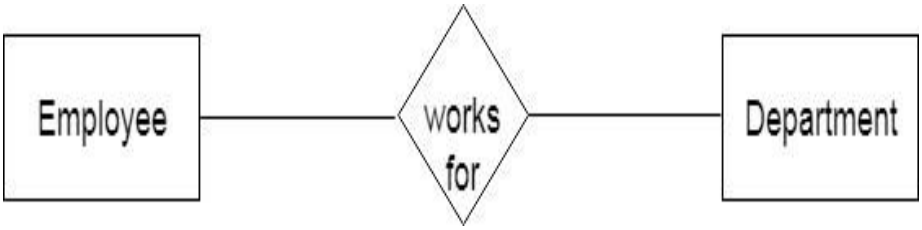
Component of ER Diagram



1. Entity:

A substance may be anything, class, individual or spot. In the ER frame, a substance can be tended to as square shapes.

Think about a relationship as a delineation chief, thing, specialist, office, etc can be taken as a substance.



1. Powerless Entity

A substance that depends upon another component called afrail substance. The frail element contains no critical trait of its own. The feeble substance is addressed by a twofold square shape.

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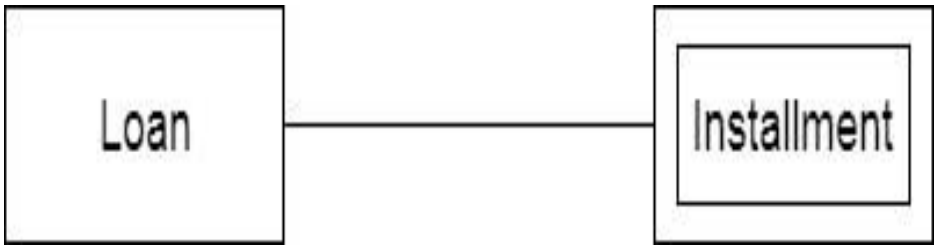
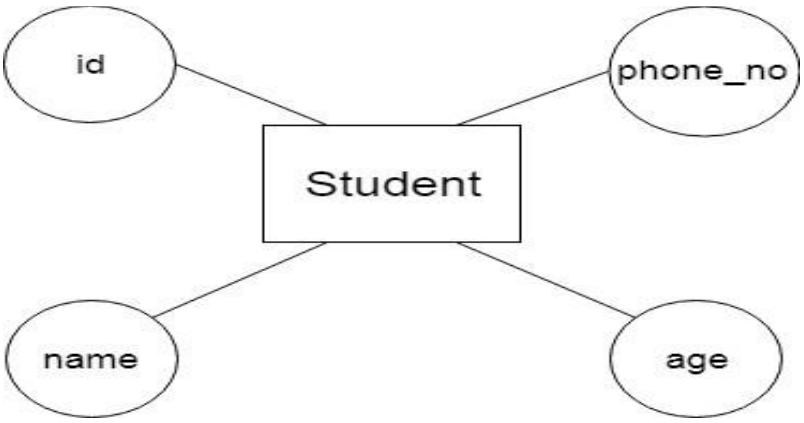


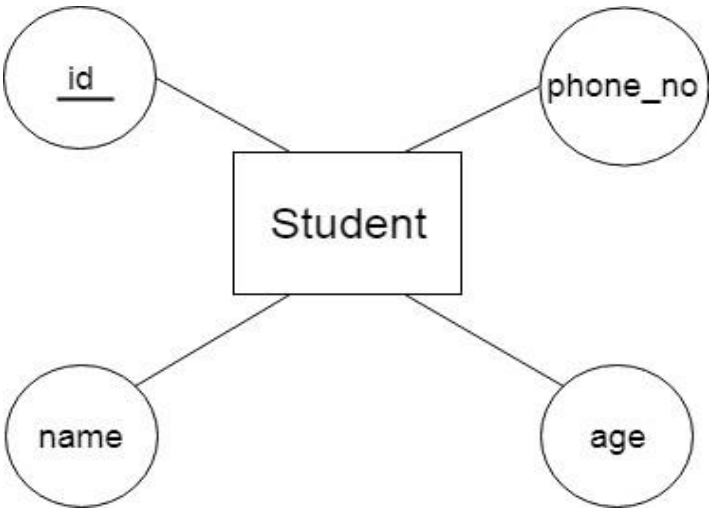
2. Characteristic

The quality is utilized to depict the property of a section. Obscure is utilized to address a quality.
For example, id, age, contact number, name, etc can be attributes of a student.



a. Key Attribute

The key quality is used to address the essential ascribes of a substance. It tends to a fundamental key. The key property is tended to by a circle with the text underlined**.**



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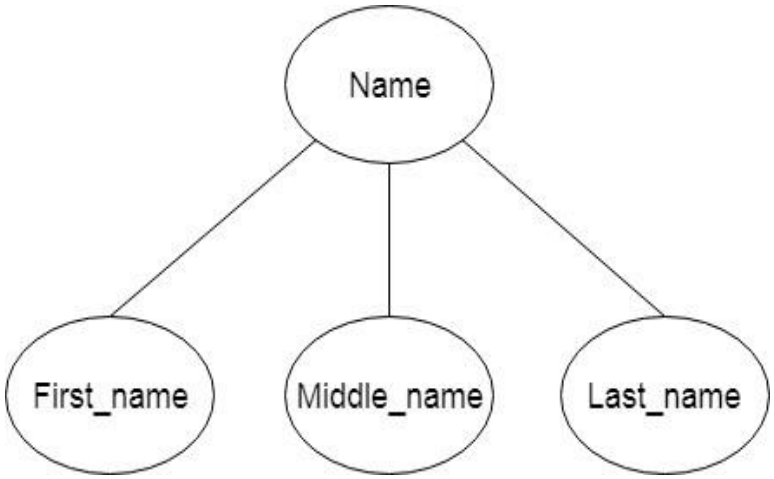
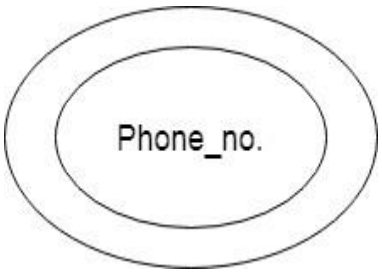
b. Composite Attribute

A property that made from various attributes is known as a composite quality. The composite trademark is tended to by an oval, and those circles are related with a circle**.**



c. Multivalued Attribute

A quality can have more than one worth. These qualities are known as a multivalued property. The twofold oval is used to address multivalued property. For example, a student can have more than one phone number.



d. Determined Attribute

A property that can be gotten from another quality is known as a decided attribute. It will in general be tended to by a ran circle.For example, a singular's age changes long term and can be gotten from one more quality like Date of birth.

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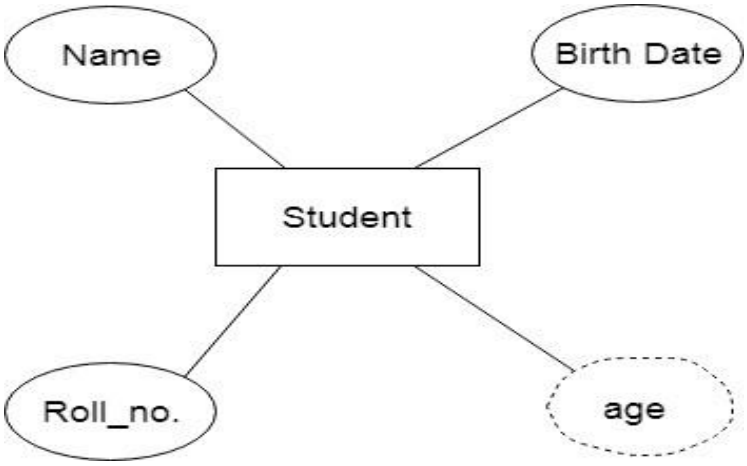
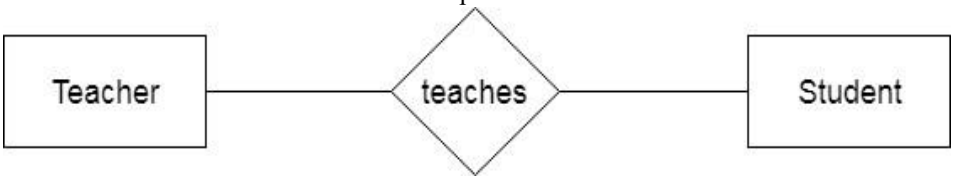


3. Relationship

A relationship is used to depict the connection between substances.

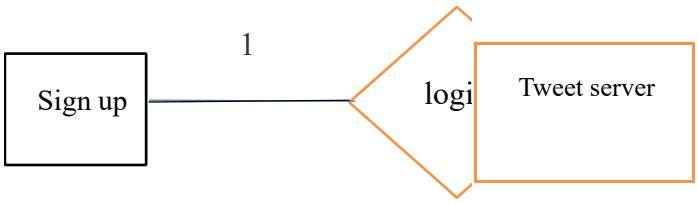
Important stone or rhombus is utilized to address the relationship.



Sorts of relationship are as per the following:

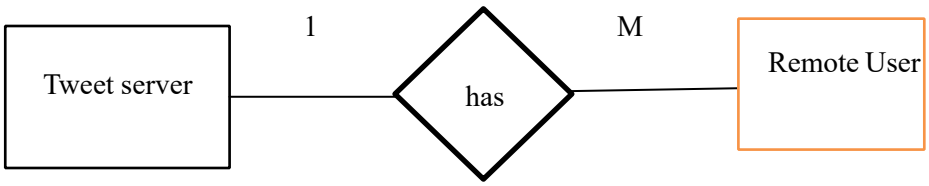
a. One-to-One relationship

At the point when just a single instance of a component is connected with the relationship, then it is known as facilitated relationship.For instance, A female can wed to one male, and a male can wed to one female.



b. One-to-many relationship

Exactly when simply a solitary illustration of the substance on the left, and more than one event of a component on the right associates with the relationship then this is known as a one-to-various connections. For example, Scientist can envision various manifestations, but the improvement is done by the really express analyst.



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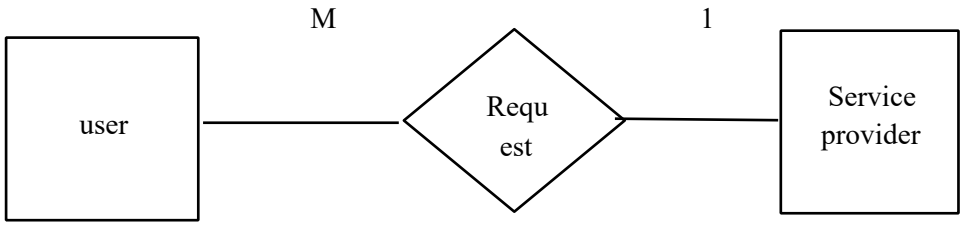
c. Many-to-one relationship

Exactly when more than one event of the component on the left, and simply a solitary event of a substance on the right associates with the relationship then it is known as a many-to-one relationship.

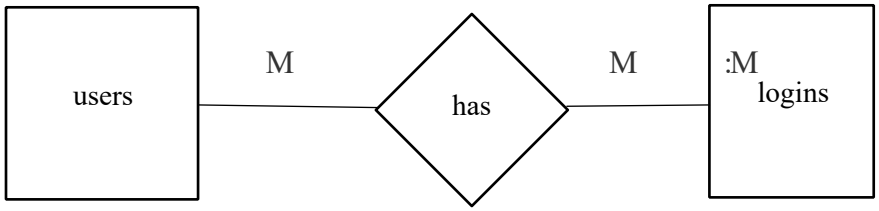
For example, Student enrols for only a solitary course, but a course can have various students.



d. Many-to-many relationship

At the point when more than one event of the substance on the left, and more than one event of a component on the right associates with the relationship then it is known as a many-to-various connections.

For example, Employee can allot by numerous exercises and project can have various specialists.



ER-Diagram:

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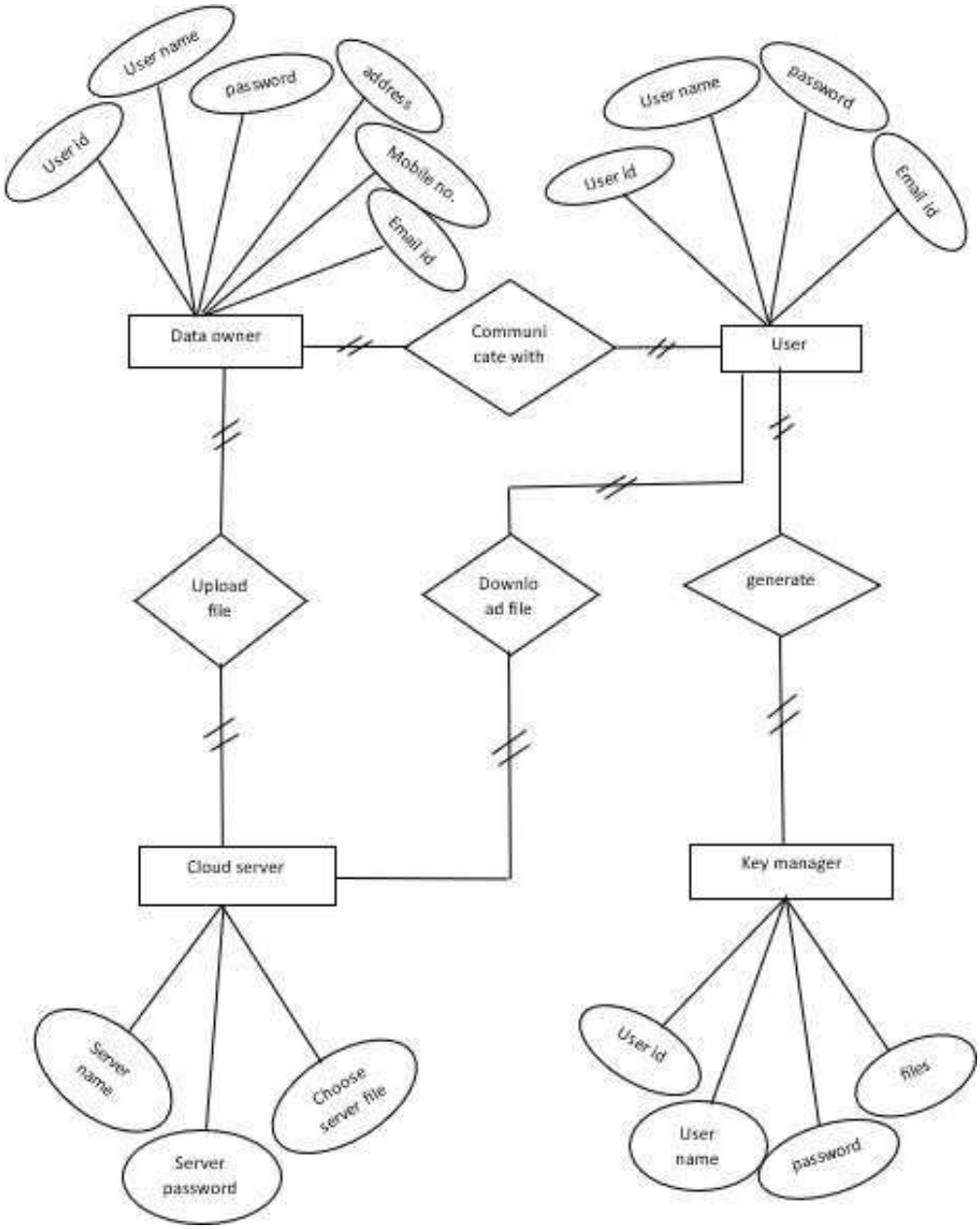

Fig.no: 3.1.2 ER Diagram for overall project

3.2. Data Dictionary

A Data Dictionary compiles names, definitions, and attributes concerning data elements utilized or stored within a database, information system, or part of a research project. It delineates the meanings and functions of data elements within the context of a project and offers guidance on understanding, recognizing meanings, and description. Additionally, a Data Dictionary offers metadata about data elements, aiding in defining the scope and attributes of data elements, as well as the guidelines for their usage and application.

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Table name: User

Column Name	Data Type	Size	Constraint
User id	Number()	20	Primary key
Username	Varchar2()	30	Not null
Email	Varchar2()	30	Not null
Address	Varchar2()	30	Not null

Table no.3.2.1 User

Table name: Data Owner

Name	Data Type	Size	Constraints
User id	Number()	20	Primary key
User name	Varchar2()	30	Not null
IP address	Varchar2()	200	Not null
Email	Varchar2()	30	Not null
Location	Varchar2()	60	Not null
Passsword	Varchar2()	30	Not null

Table no.3.2.2 Data Owner

Table Name: Cloud Server

Name	Data Type	Size	Constraints
Server id	Number()	20	Primary key
Server name	Varchar2()	30	Not null
password	Varchar2()	30	Not null

Table no.3.2.3 Cloud Server

Table Name: Key Manager

Name	Data Type	Size	Constraints
Key id	Number()	20	Primary key
Key Type	Varchar()	30	Not null
Key Length	Number()	128	Not null

Table no.3.2.4 Key Manager

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Normalization

Normalization is the primary method for optimizing data in a database to fulfill two essential criteria:
Data dependencies are logical, ensuring that all related data items are stored together. Normalization is crucial for various reasons, primarily because it enables databases to occupy minimal disk space, resulting in enhanced performance.
Normalization is also referred to as data standardization.

The three primary types of normalization are outlined below. Note: "NF" stands for "normal form."

1. First typical structure (1NF)

Tables in 1NF should comply with certain standards:

1. Every cell should contain just a solitary (nuclear) esteem.
2. Each part in the table ought to be astoundingly named. 3. All characteristics in a part ought to connect with a comparative region.

User id	Username	Password
015	John	********
016	Princess	********
027	Tom	********
028	Claire	********
029	Robert	********

Table.no: 3.2.5 1NF

2. Second typical structure (2NF)

Tables in 2NF ought to be in 1NF and not have any most of the way dependence (e.g., each non-prime quality ought to be dependent upon the table's fundamental key).

User Id	Received Data through IOT	pswd	Login
1	11	********	Sign_up
2	12	********	Sign_up
3	13	********	Sign_up
4	14	********	Sign_up
5	15	********	Sign_up

Table.no:3.2.6 2NF

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3. Third ordinary structure (3NF)

Tables in 3NF ought to be in 2NF and have no transitive reasonable circumstances on the fundamental key. The going with two NFs furthermore exists anyway are only here and there used:

USERDETAILS

ID	NAME	EMAIL	STATE	CITY	COUNTRY
11	Vijay	vijay@gmail.com	AP	RZP	INDIA
12	Vinod	vinod@gmail.com	AP	RZP	INDIA
13	Ramu	Ramu@gmail.com	AP	RZP	INDIA
14	Vishnu	vishnu@gmail.com	AP	RZP	INDIA

Table.no: 3.2.7 User Details

USER DETAILS

USER ID	PASSWORD	LOGIN
server	********	Sign_up
vijay	********	Sign_up

Table.no: 3.2.8 User Details

Boyce-Codd Normal Form (BCNF)

Normalization is a critical process in database management aimed at organizing tables to minimize anomalies and ensure data integrity. It follows a series of stages known as normal forms. These normal forms help structure tables efficiently and reduce redundancy and inconsistency in data.

Unnormalized Form (UNF): The initial state of a table where data is not organized according to any specific rules.

First Normal Form (1NF): In 1NF, each column contains atomic values, and there are no repeating groups or arrays within a row.

Second Normal Form (2NF): 2NF requires that every non-key attribute be fully functionally dependent on the primary key.

Third Normal Form (3NF): In 3NF, no transitive dependencies should exist, meaning that non-key attributes should not depend on other non-key attributes.

Elementary Key Normal Form (EKNF): EKNF is a further refinement of 3NF, emphasizing the use of elementary keys.

Boyce-Codd Normal Form (BCNF): BCNF addresses anomalies that may arise when multiple candidate keys exist. It requires that for every non- trivial functional dependency (X → Y), X must be a superkey.

Fourth Normal Form (4NF): To achieve 4NF, a table must be in BCNF and should not have multi-valued dependencies.

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Essential Tuple Normal Form (ETNF): ETNF is a condition where each attribute in a tuple is essential to the understanding of the tuple itself.

Normal Form	Description
1NF	An alliance is in 1NF enduring it contains an atomic worth.
2NF	An association will be in 2NF expecting it is in 1NF and all non-key credits are totally down to earth ward on the fundamental key.
3NF	An alliance will be in 3NF enduring it is in 2NF and no change dependence exists.
BCNF	A more grounded importance of 3NF is known as Boyce Codd's common design.
4NF	An association will be in 4NF expecting it is in Boyce Codd's commonplace construction and has no multi-regarded dependence.
5NF	An association is in 5NF. In case it is in 4NF and contains no join dependence, joining should be lossless.

Benefits of Normalization:

Reduction of data redundancy: Normalization helps eliminate redundant data by organizing it efficiently across tables. Improved overall database organization: By structuring data according to normalization rules, databases become more organized and easier to manage. Data consistency within the database:

Normalization ensures that data remains consistent across tables, reducing the risk of inconsistencies. More flexible database design:

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Normalization allows for more flexibility in database design, making it easier to accommodate changes and updates. Upholds the principle of data integrity: Normalization promotes data integrity by minimizing anomalies and ensuring accurate representation of data relationships.

Disadvantages of Normalization:

Careless decomposition: If normalization is done without a clear understanding of user requirements, it can lead to excessive decomposition and unnecessary complexity in the database design.

Decreased performance: As tables are normalized to higher normal forms such as 4NF or 5NF, it may lead to decreased performance due to increased join operations and complexity in querying the database.

UML DIAGRAM INTRODUCTION

The unified modeling language allows the software engineer to express an analysis model using the modeling notation that is governed by a set of syntax, semantic and pragmatic rules. A UML system is represented using five different views that describe the system from distinctly different perspective.

UML is specifically constructed through two different domains they are:

- UML Analysis modeling, this focuses on the user model and structural model views of the system.
- UML design modeling, which focuses on the behavioral modeling, implementation modeling and environmental model views.

SYSTEM DESIGN ASPECTS

Once the analysis stage is completed, the next stage is to determine in broad outline form how the problem might be solved. During system design, we are beginning to move from the logical to physical level.

System design involves architectural and detailed design of the system. Architectural design involves identifying software components, decomposing them into processing modules and conceptual data structures, and specifying the interconnections among components.

Detailed design is concerned with how to package processing modules and how to implement the processing algorithms, data structures and interconnections of standard algorithms, invention of new algorithms, and design of data representations and packaging of software products.

Two kinds of approaches are available:

- Topdown approach
- Bottomup approach

Design of Code

Since information systems projects are designed with space, time and cost saving in mind, coding methods in which conditions, words, ideas or control errors and speed the entire process. The purpose of the code is to facilitate the identification and retrieval of the information. A code is an ordered collection of symbols designed to provide unique identification of an entityor an attribute.

Design of Input

Design of input involves the following decisions

- Input data
- Input medium

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- The way data should be arranged or coded
- Validation needed to detect every step to follow when error occurs

The input controls provide ways to ensure that only authorized users access the system guarantee the valid transactions, validate the data for accuracy and determine whether any necessary data has been omitted. The primary input medium chosen is display. Screens have been developed for input of data using HTML. The validations for all important inputs are taken care of through various events using JSP control.

Design of Output

Design of output involves the following decisions

- Information to present
- Output medium
- Output layout

Output of this system is given in easily understandable, user-friendly manner, Layout of the output is decided through the discussions with the different users.

Design of Control

The system should offer the means of detecting and handling errors.

Input controls provides ways per

- Valid transactions are only acceptable
- Validates the accuracy of data
- Ensures that all mandatory data have been captured

All entities to the system will be validated. And updating of tables is allowed for only valid entries. Means have been provided to correct, if any by change incorrect entries have been entered into the system they can be edited.

3.3 UML DESIGN

Why We Use UML in projects?

As the strategic value of software increases for many companies, the industry looks for techniques to automate the production of software and to improve quality and reduce cost and time-to-market. These techniques include component technology, visual programming, patterns and frameworks. Businesses also seek techniques to manage the complexity of systems as they increase in scope and scale. In particular, they recognize the need to solve recurring architectural problems, such as physical distribution, concurrency, replication, security, load balancing and fault tolerance. Additionally, the development for the World Wide Web, while making some things simpler, has exacerbated these architectural problems. The Unified Modeling Language (UML) was designed to respond to these needs. Simply, Systems design refers to the process of defining the architecture, components, modules, interfaces, and data for a system to satisfy specified requirements which can be done easily through UML diagrams.

In the project four basic UML diagrams have been explained among the following list:

- Class Diagram
- Use Case Diagram

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- Sequence Diagram
- Activity Diagram
- Collaboration Diagram
- Deployment Diagram
- State Chart Diagram
- Component Diagram

Class Diagram

A Class diagram in the Unified Modeling Language (UML) is a type of static structure diagram that describes the structure of a system by showing the system's classes, their attributes, and the relationships between the classes.

This is one of the most important of the diagrams in development. The diagram breaks the class into three layers. One has the name, the second describes its attributes and the third its methods. A padlock to left of the name represents the private attributes. The relationships are drawn between the classes. Developers use the Class Diagram to develop the classes. Analyses use it to show the details of the system.

Architects look at class diagrams to see if any class has too many functions and see if they are required to be split.

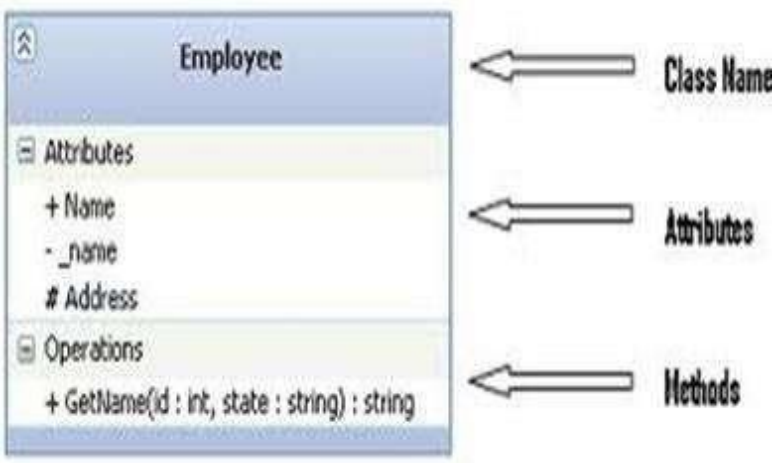

Fig.no.3.3.1: Class Diagram

Use Case Diagram

A Use Case diagram in the Unified Modeling Language (UML) is a type of behavioral diagram defined by and created from a Use-case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals (represented as use cases), and any dependencies between those use cases. The main purpose of a use case diagram is to show what are performed for which actor. Roles of the actors in the system can be depicted.

Use cases are used during requirements elicitation and analysis to represent the functionality of the system. Use cases focus on the behavior of the system from the external point of view. The actors are outside the boundary of the system, whereas the use cases are inside the boundaryof the system.

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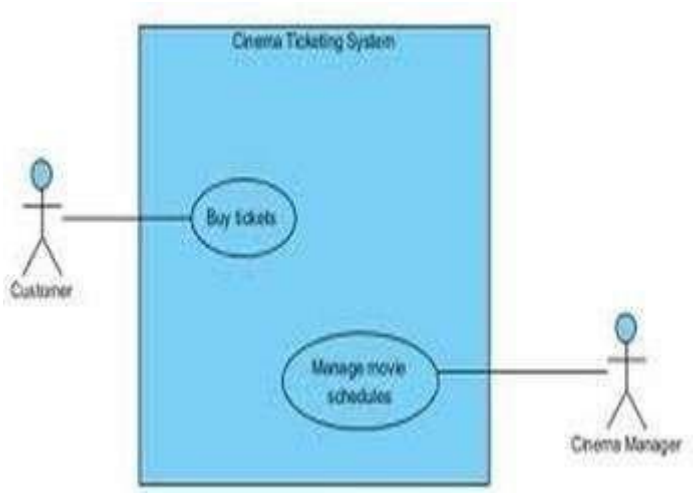

Fig.no.3.3.2: Use Case Diagram

Sequence Diagram

A Sequence diagram in Unified Modeling Language (UML) is a kind of interaction diagram that shows how processes operate with one another and in what order. It is a construct of a Message Sequence Chart. Sequence diagrams are sometimes called Event-trace diagrams, event scenarios, and timing diagrams.

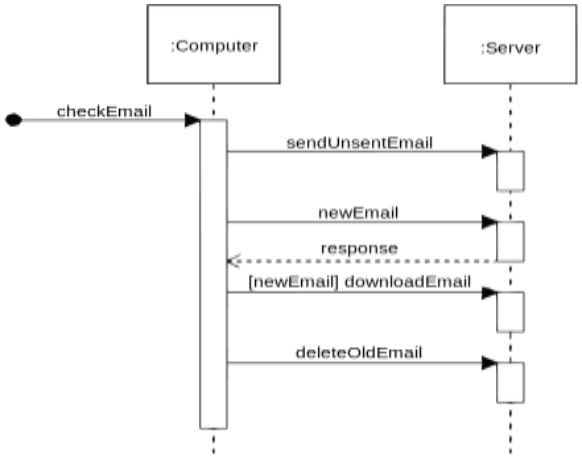

Fig.no.3.3.3 Sequence Diagram

Activity Diagram

Activity diagrams are a loosely defined diagram technique for showing workflows of stepwise activities and actions, with support for choice, iteration and concurrency. In the Unified Modeling Language, activity diagrams can be used to describe the business and operational step-by-step workflows of components in a system. An activity diagram shows the overall flow of control.

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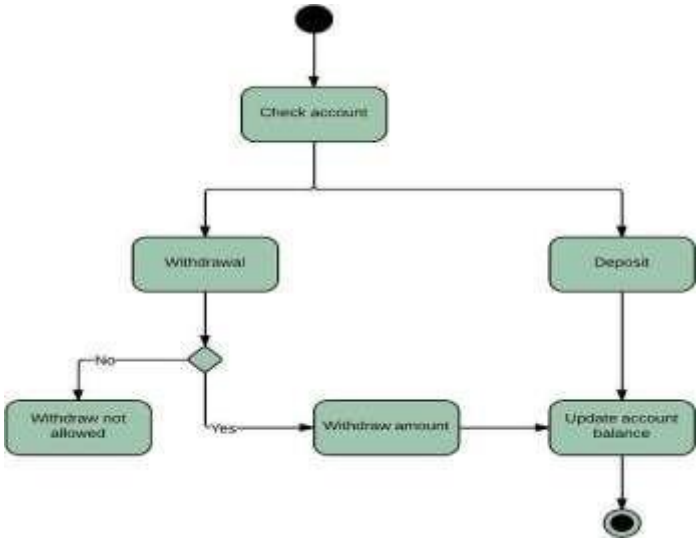

Fig.no.3.3.4: Activity Diagram

Collaboration Diagram

A Communication diagram models the interactions between objects or parts in terms of sequenced messages. Communication diagrams represent a combination of information taken from Class, Sequence, and Use Case Diagrams describing both the static structure and dynamic behavior of a system.

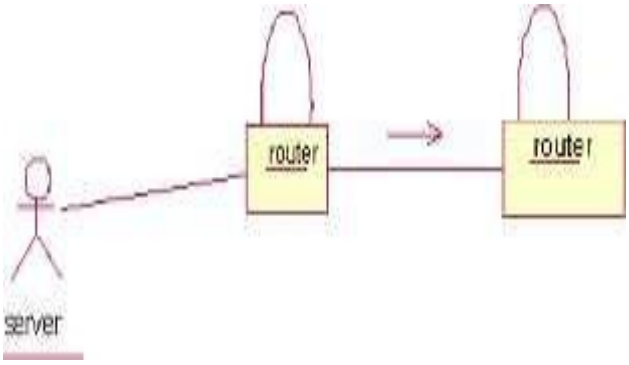

Fig.no.3.3.5 Collaboration Diagram

Deployment Diagram

A Deployment diagram in the Unified Modeling Language models the physical deployment of artifacts on nodes. To describe a web site, for example, a deployment diagram would show what hardware components ("nodes") exist (e.g., a web server, an application server, and a database server), what software components ("artifacts") run on each node (e.g., web application, database), and how the different pieces are connected e.g.
JDBC, REST.

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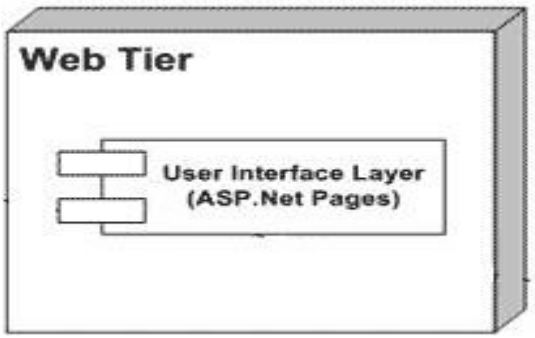

Fig.no.3.3.6: Deployment Diagram

State Chart Diagram

A State diagram is a type of diagram used in computer science and related fields to describe the behavior of systems. State diagrams require that the system described is composed of a finite number of states sometimes, this is indeed the case, while at other times this is a reasonable abstraction. Many forms of state diagrams exist, which differ slightly and have different semantics.

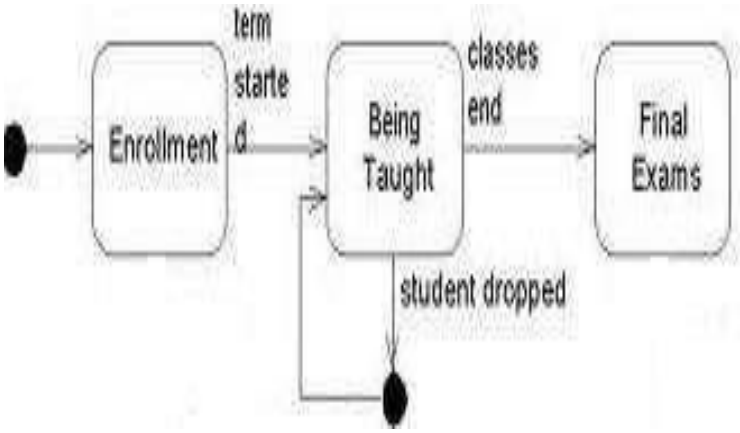

Fig.no.3.3.7:State Chart Diagram

Component Diagram

In the Unified Modeling Language, a component diagram depicts how components are wired together to form larger components and or software systems. They are used to illustrate the structure of arbitrarily complex systems.

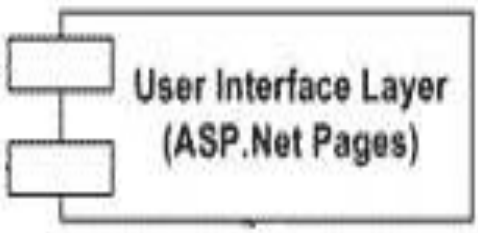

Fig.no.3.3.8: Component Diagram

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UML DIAGRAMS

UML stands for Unified Modeling Language. UML is a standardized of one of general-purpose modeling language in the field of object-oriented software engineering. The standard is managed, and was created by, the Object Management Group.
The goal is for UML to become a common language for creating models of object oriented computer software. In its current form UML is comprised of two major components: a Meta-model and a notation. In the future, some form of method or process may also be added to; or associated with, UML.
The Unified Modeling Language is a standard language for specifying, Visualization, Constructing and documenting the artifacts of software system, as well as for business modeling and other non-software systems. The UML represents a collection of best engineering practices that have proven successful in the modeling of large and complex systems.
The UML is a very important part of developing objects oriented software and the software development process. The UML uses mostly graphical notations to express the design of software projects.

GOALS:

1. The Primary goals in the design of the UML are as follows:
2. Provide users a ready-to-use, expressive visual modeling Language so that they can develop and exchange meaningful models.
3. Provide extendibility and specialization mechanisms to extend the core concepts.
4. Be independent of particular programming languages and development process.
5. Provide a formal basis for understanding the modeling language.
6. Encourage the growth of OO tools market.
7. Support higher level development concepts such as collaborations, frameworks, patterns and components.
8. Integrate best practices.

3.3.1 USE CASE DIAGRAM:

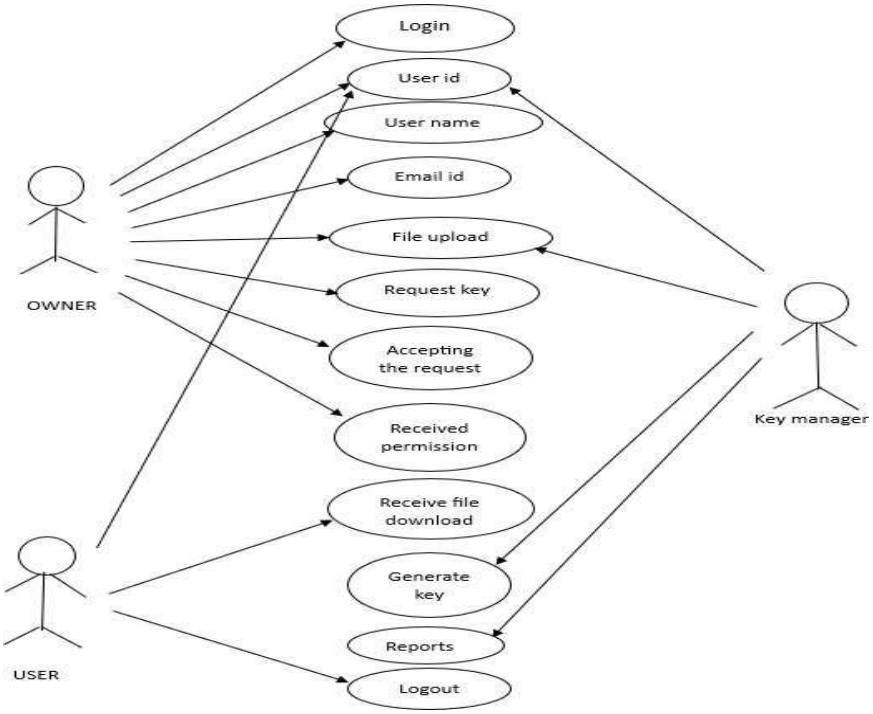

Fig.no.3.3.1.1: Use Case Diagram for Overall project

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Description: In this use case diagram sender and receiver is an actor. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals (represented as use cases), and any dependencies between those use cases. The main purpose of a use case diagram is to show what system functions are performed for which actor.

3.3.2 CLASS DIAGRAM

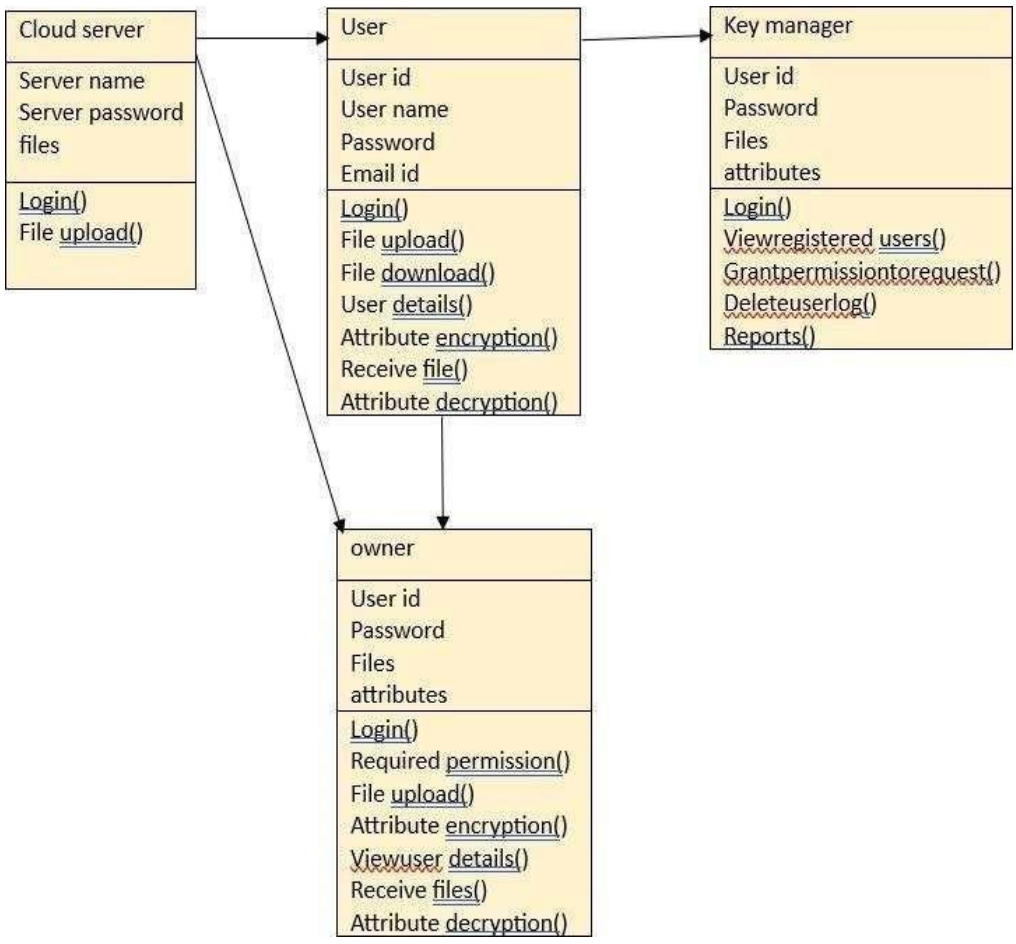
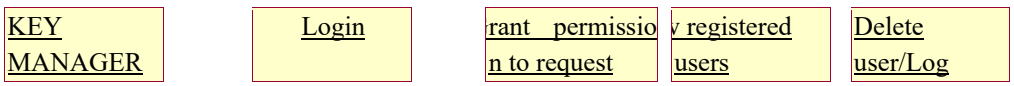


Fig.no.3.3.2.1:Class Diagram for overall project

Description: In this class diagram using two object source and destination. In the user object class the file name, id address source id as string. In the class diagram some operations and attributes. In the system class system id as integer, name, system-type as string. Some operations are involved in the class.

3.3.3 SEQUENCE DIAGRAM



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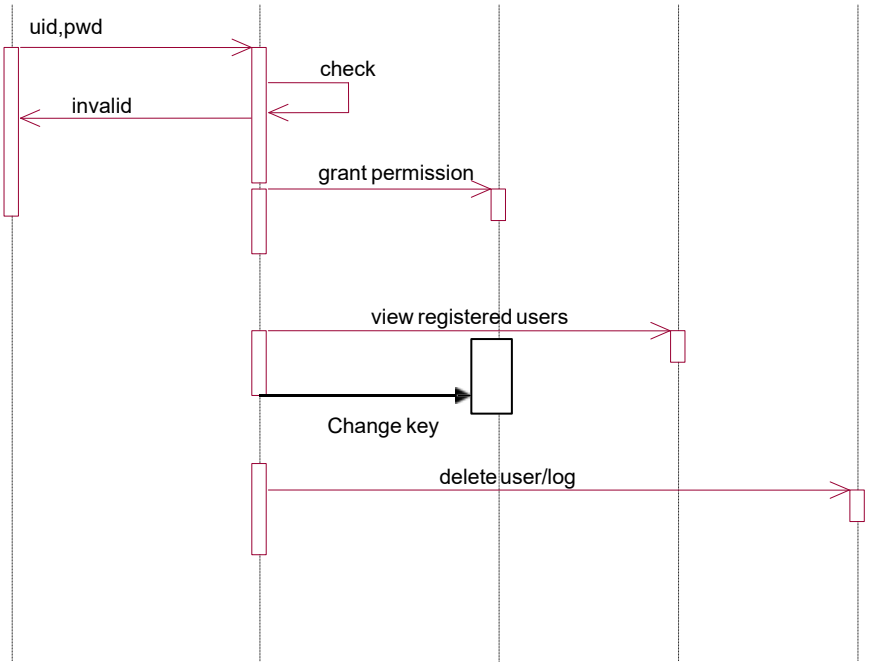

Fig.no.3.3.3.1:Sequence Diagram for overall project Description: A Sequence diagram in Unified Modelling Language (UML) is a kind of interaction diagram that shows how processes operate with one another and in what order. It is a construct of a Message Sequence Chart. Sequence diagrams are sometimes called event diagrams, event scenarios, and timing diagrams.

3.3.4 ACTIVITY DIAGRAM

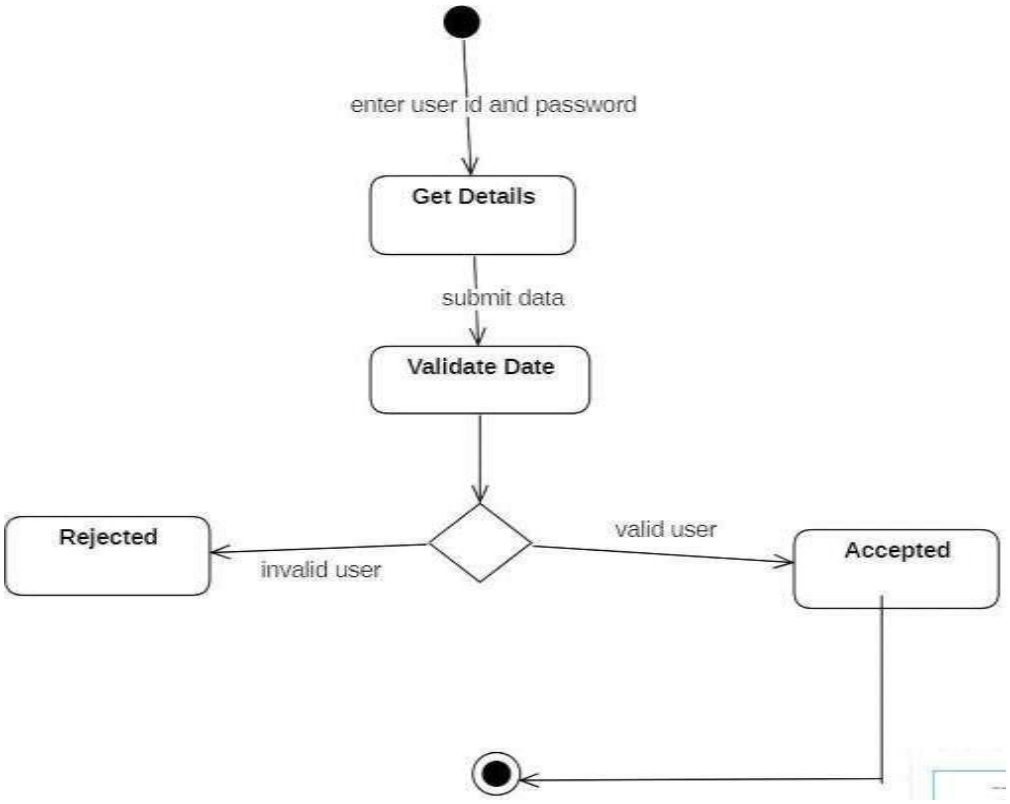

Fig.no.3.3.4.1: Activity Diagram for overall project

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Description: Activity diagrams are graphical representations of workflows of stepwise activities and actions with support for choice, iteration and concurrency. In the Unified Modelling Language, activity diagrams can be used to describe the business and operational step-by-step workflows of the ones components in a system. An activity diagram shows the overall flow of control.

3.3.5 DEPLOYMENT DIAGRAM

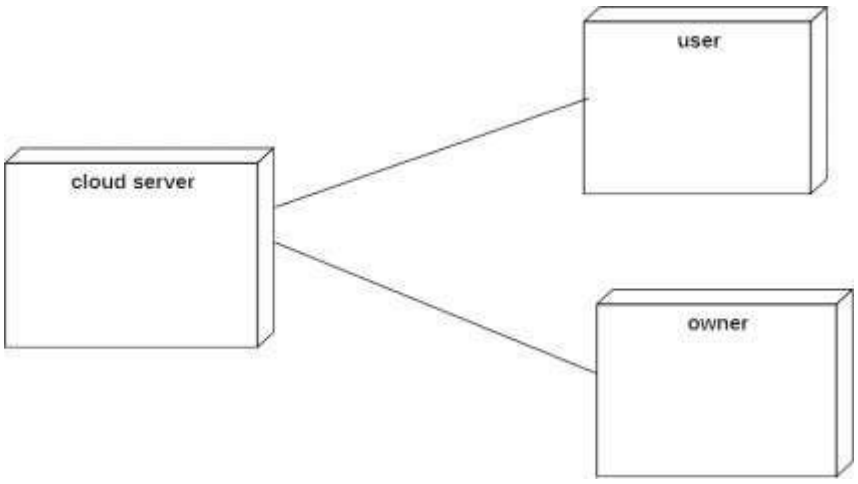

Fig.no.3.3.5.1 Deployment Diagram for overall project

Description: This deployment diagram provides a high-level overview of the Architecture for network traffic analysis using machine learning,but actual implementations may vary depending on specific requirements, infrastructure, and available technologies. It typically involves multiple components distributed across various layers of the network infrastructure.

4. TESTING

The purpose of testing is to discover errors. Testing is the process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components, sub-assemblies, assemblies and/or a finished product It is the process of exercising software with the intent of ensuring that the Software system meets its requirements and user expectations and does not fail in an unacceptable manner. There are various types of tests. Each test type addresses a specific testing requirement. Testing is one of the most important phases in the software development activity. In software development life cycle (SDLC), the main aim of testing process is the quality; the developed software is tested against attaining the required functionality and performance. During the testing process the software is worked with some particular test cases and the output of the test cases are analyzed whether the software is working according to the expectations or not.

4.1 TESTING METHODOLOGIES

Software Testing is a critical element of software quality assurance and represents the ultimate review of specification, design and coding, Testing presents an interesting anomaly for the software engineer.

4.1.1. Testing Objectives

1. Testing is a process of executing a program with the intent of finding an error.
2. A good test case is one that has a probability of finding an as yet undiscovered error.
3. A successful test is one that uncovers an undiscovered error.
4. These above objectives imply a dramatic change in view port.

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Testing cannot show the absence of defects, it can only show that software errors are present.

4.1.2. Test Case Design

Any engineering product can be tested in one of two ways:

White Box Testing

This testing is also called as glass box testing. In this testing, by knowing the specified function that a product has been designed to perform test can be conducted that demonstrates each function is fully operation at the same time searching for errors in each function. It is a test case design method that uses the control structure of the procedural design to derive test cases. Basis path testing is a white box testing.

Basis Path Testing

- Flow graph notation
- Cyclomatic Complexity

  Deriving test cases Control Structure Testing
- Condition testing
- Data flow testing
- Loop testing

Black Box Testing

In this testing by knowing the internal operation of a product, tests can be conducted to ensure that “all gears mesh”, that is the internal operation performs according to specification and all internal components have been adequately exercised. It fundamentally focuses on the functional requirements of the software. The steps involved in black box test case design are:

- Graph based testing methods
- Equivalence partitioning
- Boundary value analysis
- Comparison testing
- Graph matrices

4.1.3 Software Testing Strategies

A Strategy for software testing integrates software test cases into a series of well-planned steps that result in the successful construction of software.

Software testing is a broader topic for what is referred to as Verification and Validation. Verification refers to the set of activities that ensure that the software correctly implements a specific function. Validation refers the set of activities that ensure that the software that has been built is traceable to customer’s requirements.

4.1.4 Unit Testing

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Unit testing focuses verification effort on the smallest unit of software design that is the module. Using procedural design description as a guide, important control paths are tested to uncover errors within the boundaries of the module. The unit test is normally white box testing oriented and the step can be conducted in parallel for multiple modules.

4.1.5 Integration Testing

Integration testing is a systematic technique for constructing the program structure, while conducting test to uncover errors associated with the interface. The objective is to take unit tested methods and build a program structure that has been dictated by design.

Top-Down Integration

Top-down integrations is an incremental approach for construction of program structure. Modules are integrated by moving downward through the control hierarchy, beginning with the main control program. Modules subordinate to the main program are incorporated in the structure either in the breath-first or depth-first manner.

Bottom-up Integration

This method as the name suggests, begins construction and testing with atomic modules i.e., modules at the lowest level. Because the modules are to be tested integrated in the bottom-up manner the processing required for the modules subordinate to a given level is always available and the need for stubs is eliminated.

Regression Testing

In this contest of an integration test strategy, regression testing is the re execution of some subset of test that have already been conducted to ensure that changes have not propagate unintended side effects.

4.1.6 Validation Testing

At the end of integration testing software is completely assembled as a package. Validation testing is the next stage, which can be defined as successful when the software functions in the manner reasonably expected by the customer. Reasonable expectations are those defined in the software requirements specifications. Information contained in those sections form a basis for validation testing approach.

Reasonable expectation is defined in the software requirement specification – a document that describes all user-visible attributes of the software. The specification contains a section titled “Validation Criteria”. Information contained in that section forms the basis for a validation testing approach.

Validation Test Criteria

Software validation is achieved through a series of black-box tests that demonstrate conformity with requirement. A test plan outlines the classes of tests to be conducted, and a test procedure defines specific test cases that will be used in an attempt to uncover errors in conformity with requirements. Both the plan and procedure are designed to ensure that all functional requirements are satisfied, all performance requirements are achieved, documentation is correct and human-engineered; and other requirements are met.

After each validation test case has been conducted, one of two possible conditions exists: (1) The function or performance characteristics conform to specification and are accepted, or (2) a deviation from specification characters uncovered and a deficiency list is created. Deviation or error discovered at this stage in a project can rarely be corrected prior to scheduled completion. It is often necessary to negotiate with the customer to establish a method for resolving deficiencies.

Alpha and Beta Testing

It is virtually impossible for a software developer to foresee how the customer will really use a program. Instructions for use may be misinterpreted. Strange combination of data may be regularly used; and output that seemed clear to the tester may be unintelligible to a user in the field.

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When custom software is built for one customer, a series of acceptance tests are conducted to enable the customer to validate all requirements. Conducted by the end user rather than the system developer, an acceptance test can range from an informal "test drive" to a planned and systematically executed series of tests. In fact, acceptance testing can be conducted over a period of weeks or months, thereby uncovering cumulative errors that might degrade the system over time.

The beta test is conducted at one or more customer sites by the end user of the software. Unlike alpha testing, the developer is generally not present.

Therefore, the beta test is a "live" application of the software in an environment that cannot be controlled by the developer. The customer records all problems that are encountered during beta testing and reports these to the developer at regular intervals. As a result of problems reported during beta test, the software developer makes modification and then prepares for release of the software product to the entire customer base.

4.1.7 System Testing

System testing is actually a series of different tests whose primary purpose is to fully exercise the computer-based system. Although each test has a different purpose, all work to verify that all system elements have been properly integrated to perform allocated functions.

4.1.8 Security Testing

Attempts to verify the protection mechanisms built into the system.

4.1.9 Performance Testing

This method is designed to test runtime performance of software within the context of an integrated system.

4.2 TEST CASES

S.NO.	TEST CASES	INPUT	EXPECTED RESULT	ACTUAL RESULT	STATUS
1	User Registration	Enter all fields	User gets registered	Registration is successful	pass
2	User Registration	If user miss any field	User not registered	Registration is unsuccessful	fail
3	Cloud Server	Give the server name and password	Server home page should be opened	Server home page has been opened	pass
4	Upload Attack Dataset	Test whether the attack Dataset is uploaded or not into the system	If attack Dataset is uploaded	I cannot do further operations	pass

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5	Data Owner	Data owner has a valid key	Encrypt data using key	Data is encrypted successfully	pass
6	Key Manager	Key manager is initialized	Generate a new key	Key is generated successfully	pass

Table.no. 4.2.1: Test Cases for Overall System

5. IMPLEMENTATION

Java Technology

Java technology is both a programming language and a platform.

The Java Programming Language:

The Java programming language is a high-level language that can be characterized by all of the following buzzwords:

- Simple
- Architecture neutral
- Object oriented
- Portable
- Distributed
- High performance
- Interpreted
- Multithreaded
- Robust
- Dynamic
- Secure

With most programming languages, you either compile or interpret a program so that you can run it on your computer. The Java programming language is unusual in that a program is both compiled and interpreted. With the compiler, first you translate a program into an intermediate language called *Java byte codes* —the platform-independent codes interpreted by the interpreter on the Java platform. The interpreter parses and runs each Java byte code instruction on the computer. Compilation happens just once; interpretation occurs each time the program is executed. The following figure illustrates how this works.

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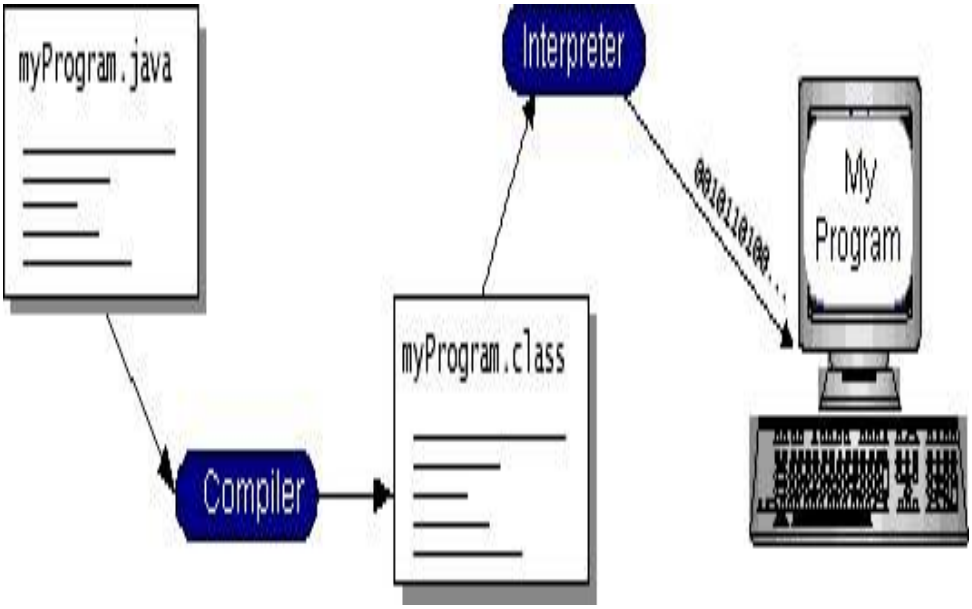

Fig.no.5.1 working of java program

If we think of Java byte codes as the machine code instructions for the *Java Virtual Machine* (Java VM). Every Java interpreter, whether it's a development tool or a Web browser that can run applets, is an implementation of the Java VM. Java byte codes help make "write once, run anywhere" possible. You can compile your program into byte codes on any platform that has a Java compiler. The byte codes can then be run on any implementation of the Java VM. That means that as long as a computer has a Java VM, the same program written in the Java programming language can run on Windows 2000, a Solaris workstation, or on an iMac.

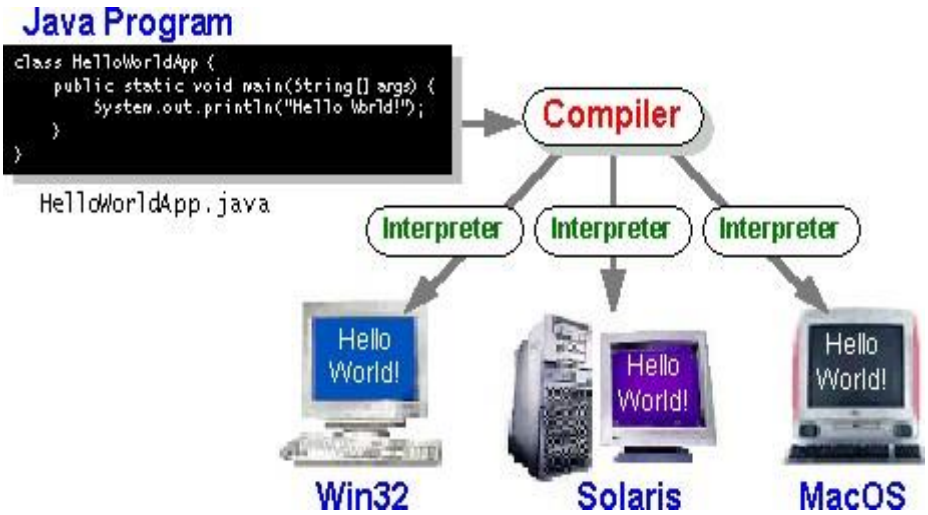

Fig.no.5.2: Implementation of Java Virtual Machine

The Java Platform

A platform is the hardware or software environment in which a program runs. We've already mentioned some of the most popular platforms like Windows 2000, Linux, Solaris, and MacOS. Most platforms can be described as a combination of the operating system and hardware. The Java platform differs from most other platforms in that it's a software-only platform that runs on top of other hardware-based platforms.

The Java platform has two components:

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- The *Java Virtual Machine* (Java VM)
- The *Java Application Programming Interface* (Java API)

You've already been introduced to the Java VM. It's the base for the Java platform and is ported onto various hardware-based platforms.

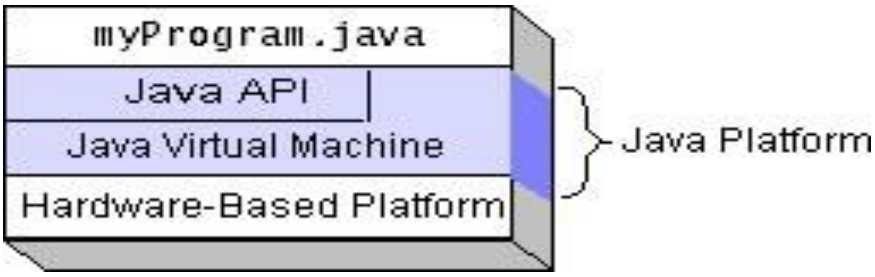

Fig.no.5.3: Program running on the Java Platform

Native code is code that after you compile it, the compiled code runs on a specific hardware platform. As a platform-independent environment, the Java platform can be a bit slower than native code. However, smart compilers, well-tuned interpreters, and just-in-time byte code compilers can bring performance close to that of native code without threatening portability. **Feasibility study:**

Technical Feasibility

GUI is developed using HTML to capture the information from the customer. HTML is used to display the content on the browser. It uses TCP/IP protocol. It is an interpreted language. It is very easy to develop a page/document using HTML some RAD (Rapid Application Development) tools are provided to quickly design/develop our application. So many objects such as button, text fields, and text area etc are provided to capture the information from the customer.

Economical Feasibility

The economical issues usually arise during the economical feasibility stage are whether the system will be used if it is developed and implemented, whether the financial benefits are equal are exceeds the costs. The cost for developing the project will include cost conducts full system investigation, cost of hardware and software for the class of being considered, the benefits in the form of reduced costs or fewer costly errors. The project is economically feasible if it is developed and installed. It reduces the work load. Keep the class of application in the view, the cost of hardware and software is considered to be economically feasible.

Operational Feasibility

In our application front end is developed using GUI. So it is very easy to the customer to enter the necessary information. But customer must have some knowledge on using web applications before going to use our application.

5.1 WORKING MODEL INSTALLATION PROCEDURE

1. Installation of java:

- Go to http://www.oracle.com/technetwork/java/javase/downloads /index.html.
- click on JDK DOWNLOAD button. run the exe file and then follow the instruction given in wizard.

To set up the path:-

- Right click on my pc and then go to my properties.

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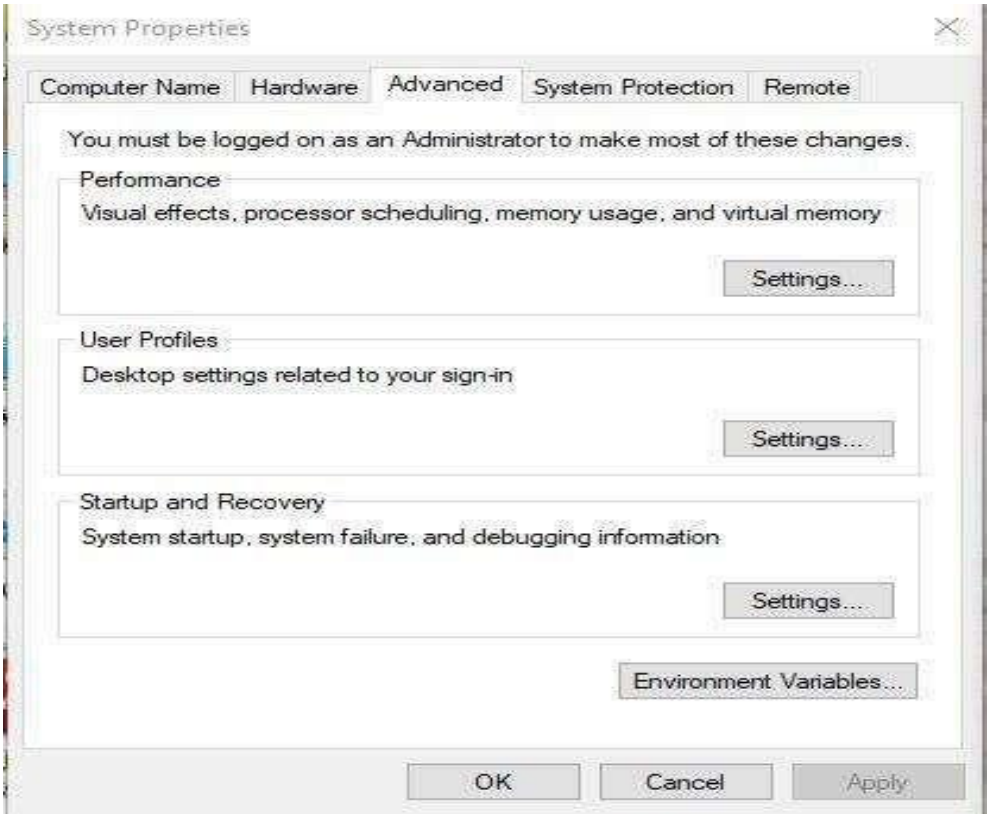

Fig no.5.1.1: Properties Wizard

o Go to advanced settings and then click on environment variables o create a class path and copy the path of the java folder where it is located in program files.

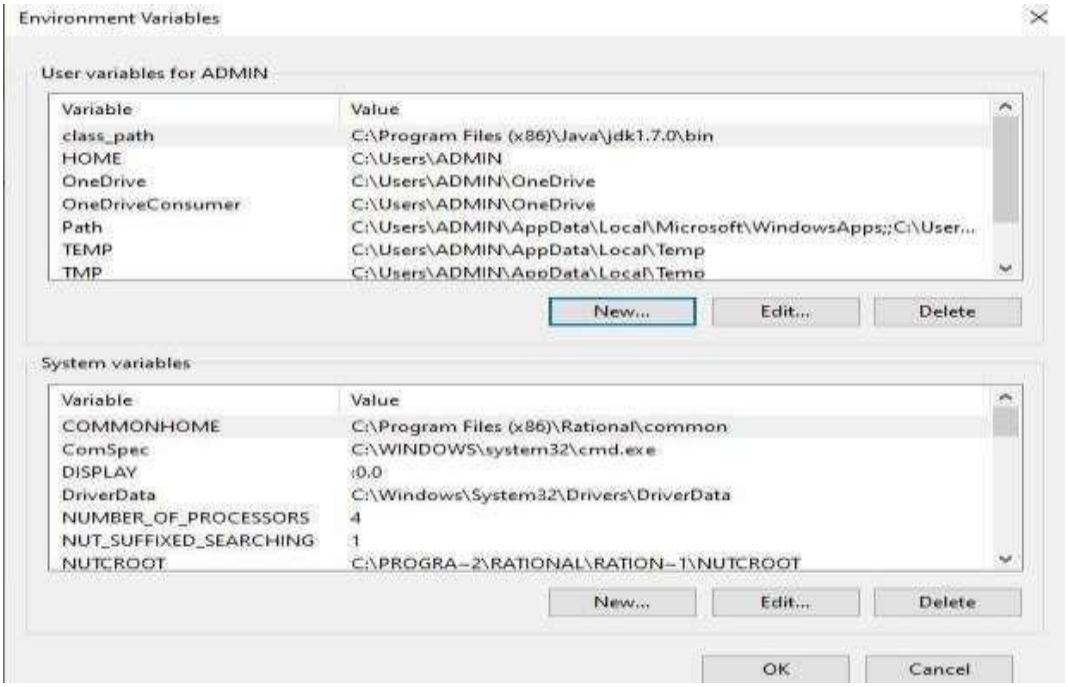

Fig no.5.1.2: path setting for java

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2. Installation and setup of Apache Tomcat:

- Go to http://tomcat.apache.org/index.html and click on download latest versions.
- Run the exe file and click on next and follow the wizard instructions.

Fig no.5.1.3: Welcome page of Tomcat

- Click on install with port number 8090 with username and password as **aits** and **aits.**
- Mention the connection port as 8090 and then click on next and finally click on finish.

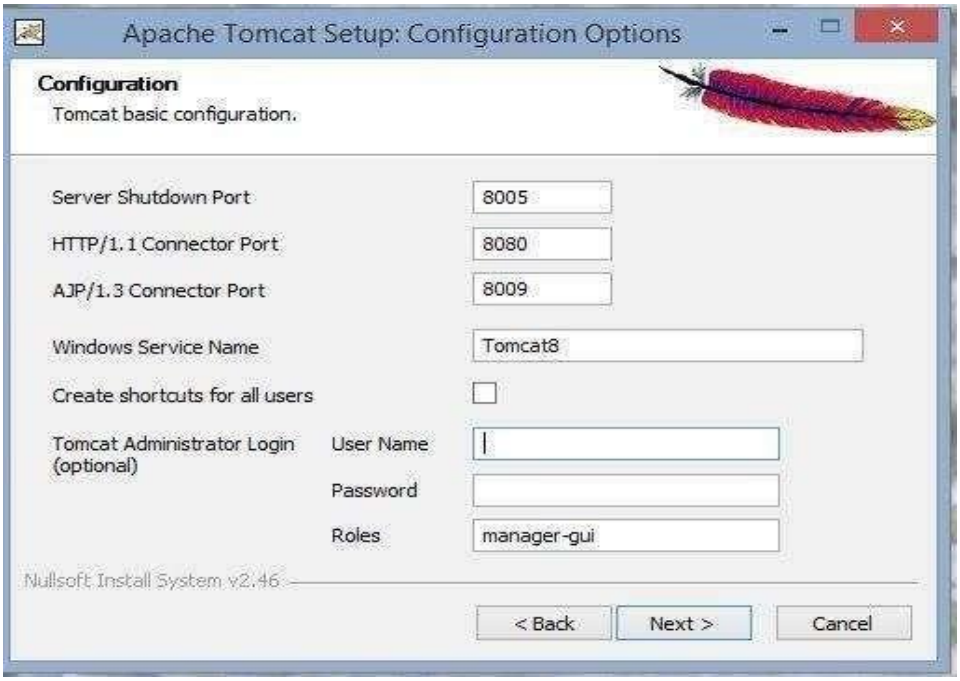

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Fig no.5.1.4: Tomcat Configuration Options Page

- Click on I agree button in. license agreement in order to accept the terms and condition.

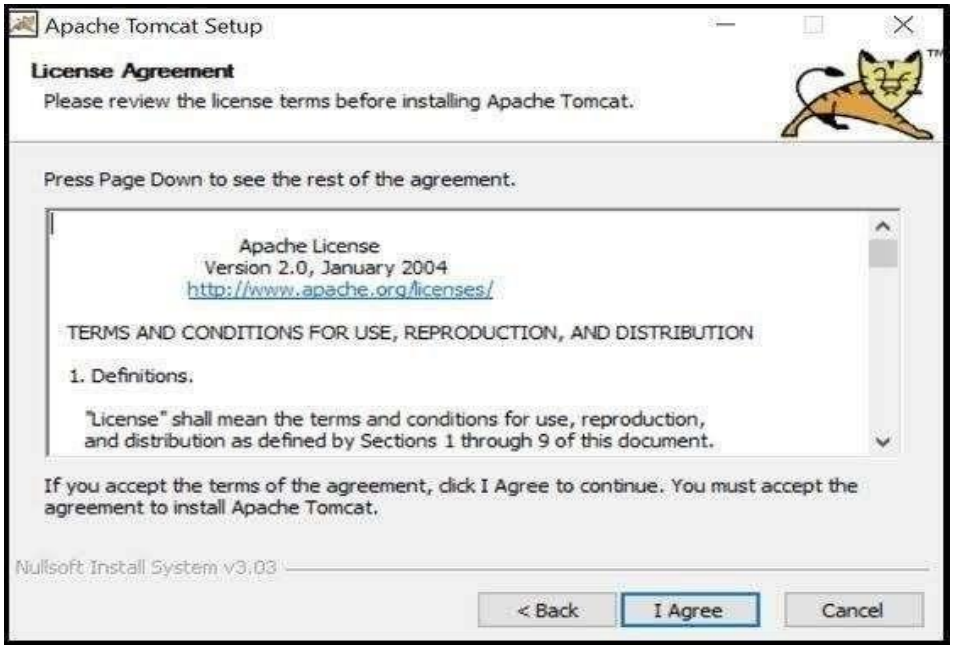

Fig no.5.1.5: Tomcat License Agreement

3. Installation and setup of SQL:

- Go tohttp://dev.mywql.com/downloads/ . and click on install button.
- After completion of installation, click on exe file and then click on next.
- Run the MySQL setup and click on next and follow the instruction in wizard.

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Fig no.5.1.6: Welcome Wizard of MYSQL

 Conform the type as typical and then click on next and follow the instructions.

Fig no.5.1.7: SQL Setup Wizard

 Now confirm the password as root in system settings field and then click on finish.

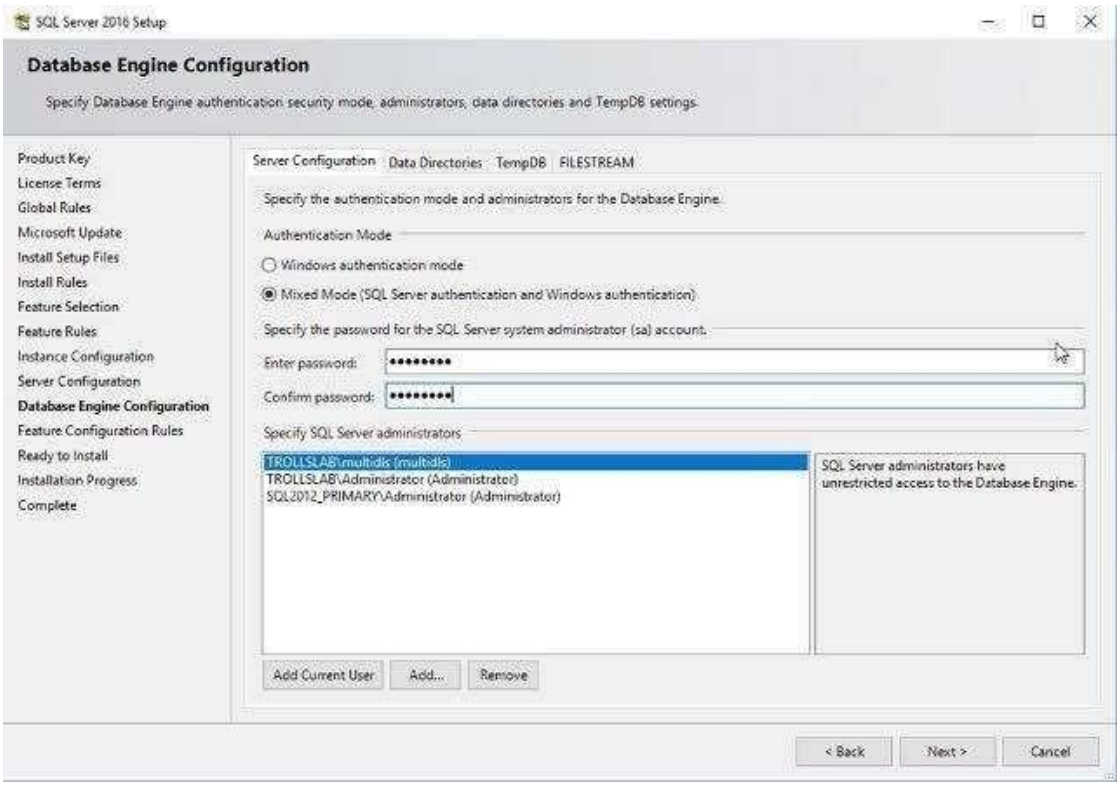

Fig no.5.1.8: Database Configuration Engine

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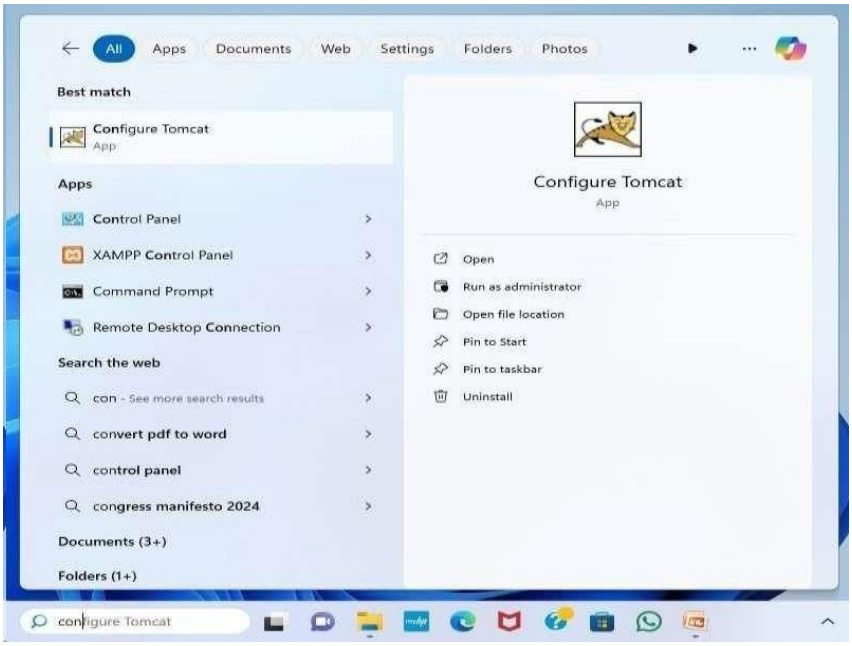
5.2 SAMPLE SCREENS

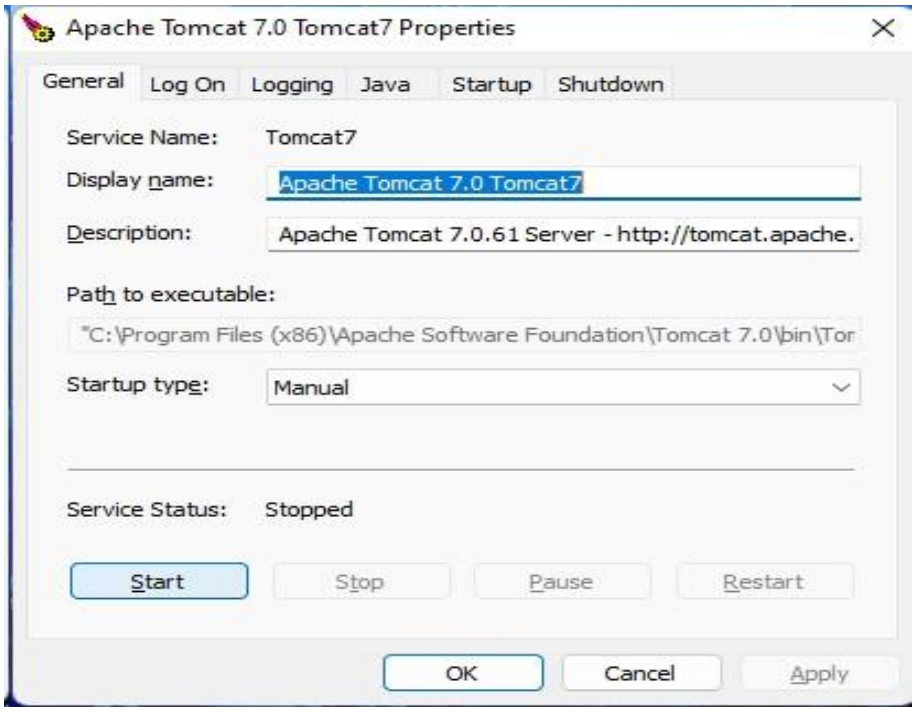
Making Apache Tomcat to run as Administrator



Screen 5.2.1 Making Apache Tomcat to run as Administrator

Description: To start our project to on the server.

Tomcat Service Status Started



Screen 5.2.2 Tomcat Service Status Started

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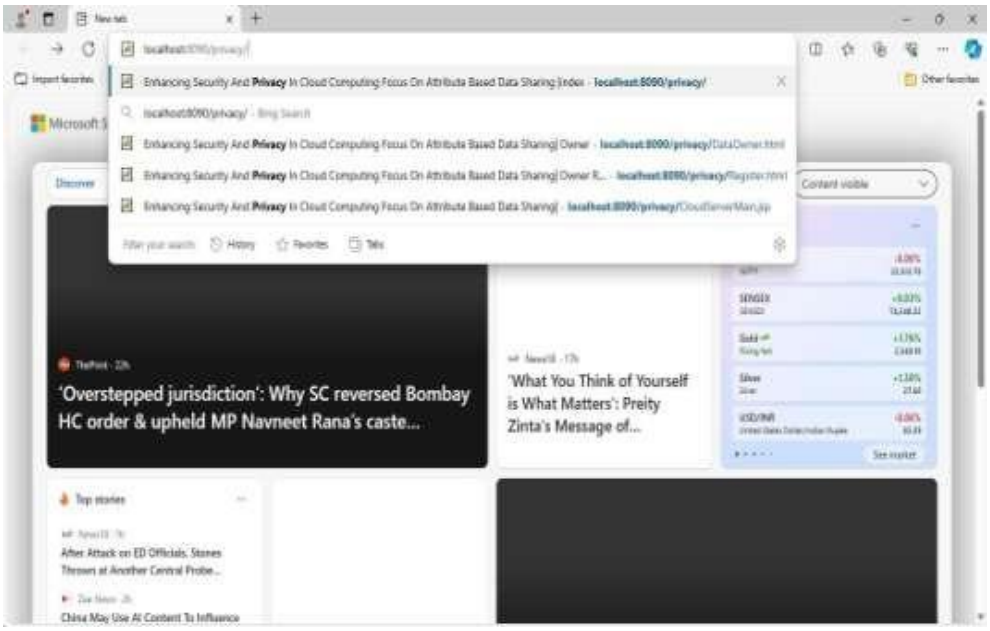
Description: To start the tomcat service started to the apache tomcat.

Our project will Open on Local Server



Screen 5.2.3 Our project will Open on Local Server

Description: To start our project will open on Local server.

Home Page

Screen 5.2.4 Home Page

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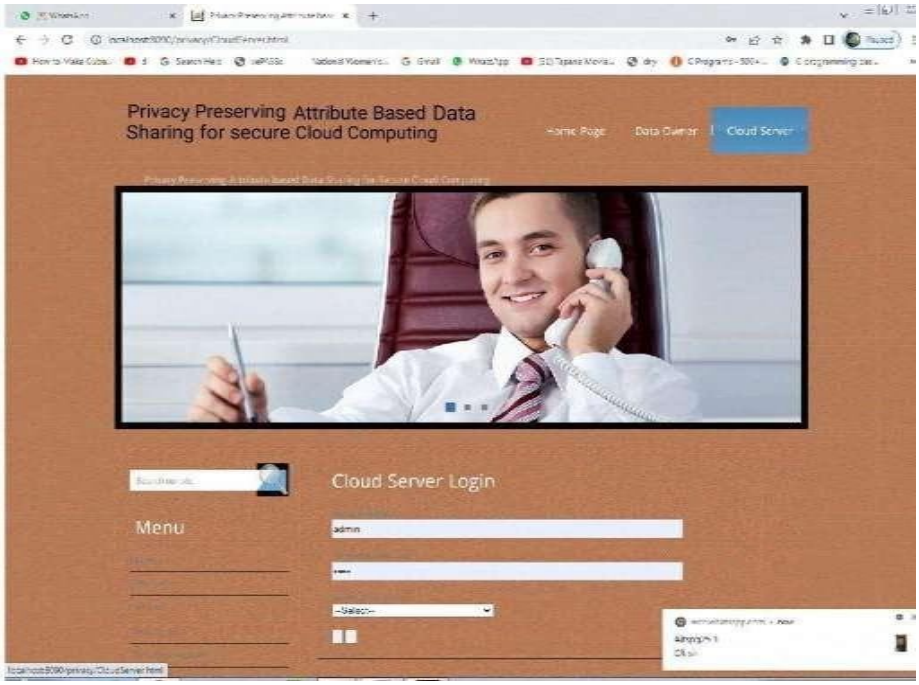
Description: Here we have the options such as data owner, cloud server to register and Login.

Cloud Server Login Page



Screen 5.2.5 Cloud Server Login Page

Description: To enter the server details such as name, password to login .

Logging details for entering into the cloud

Screen 5.2.6 Logging details for entering into the cloud

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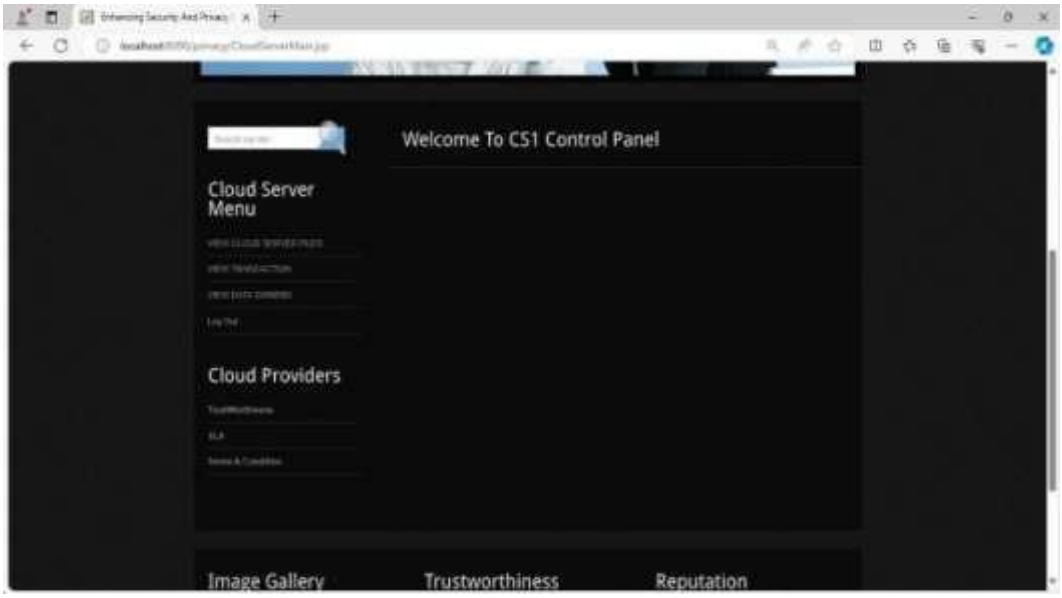
Description: For entering the logging details into the cloud to see the activities in the cloud.

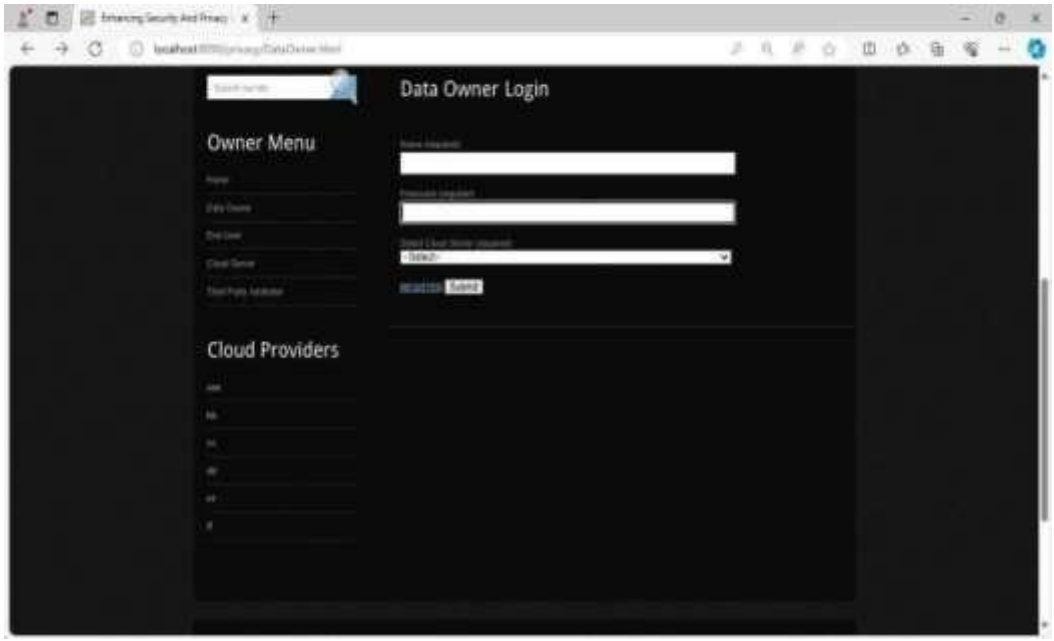
Welcome to CS1 Control Pannel



Screen 5.2.7 Welcome to CS1 Control Pannel

Description: Here we display the activities of the cloud such as view the cloud server files, view transactions, view data owners .

Data Owner Login Page



Screen 5.2.8 Data Owner Login Page

Description: Here is the data owner login page. To login the data owner to set the owner name, owner password then click on the register.

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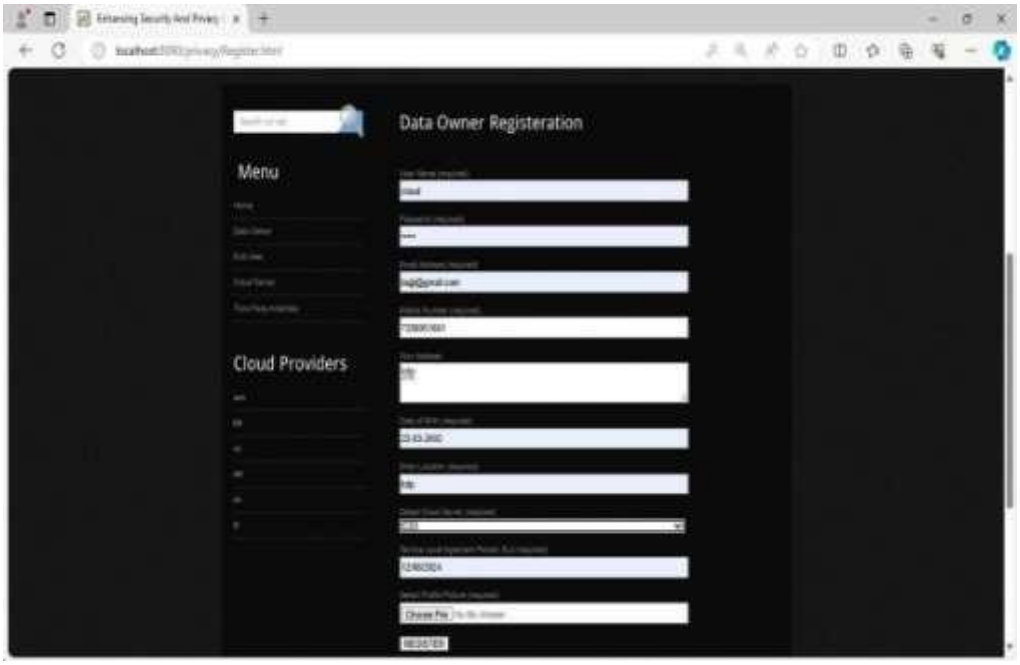
Data Owner Registering Details



Screen 5.2.9 Data Owner Registering Details

Description: Here is the data owner registering details. To enter the details of the owner the click the submit button.
Browsing Image For Data Owner

Screen 5.2.10 Browsing Image For Data Owner

Description: Here we have to browsing image for data owner.

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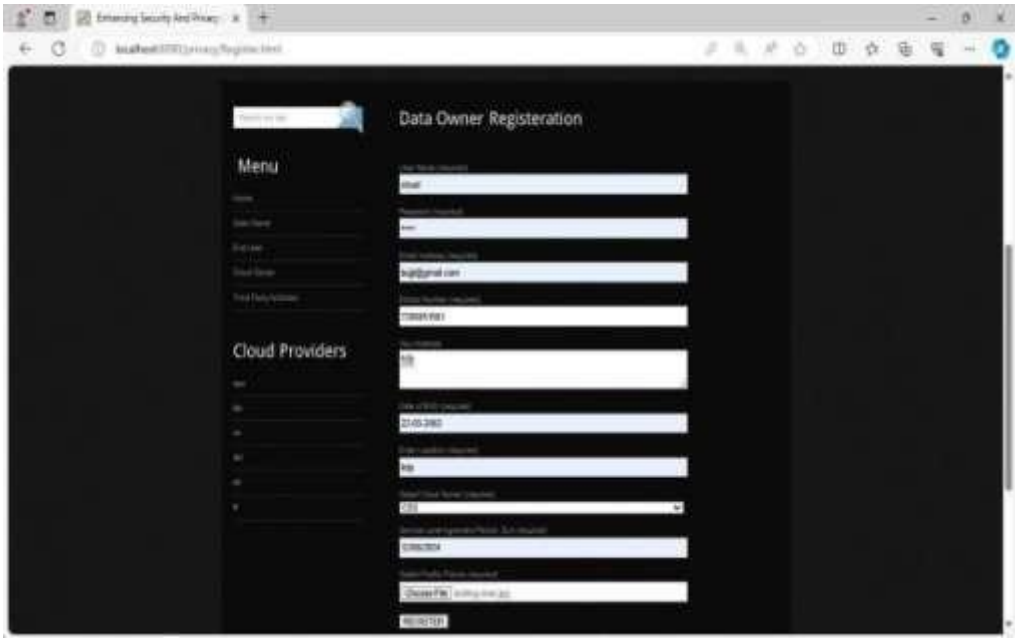
Data Owner Registering his details Successfully



Screen 5.2.11 Data Owner Registering his details Successfully

Description: Data owner registering his details successfully.

Displaying Registering User Name

Screen 5.2.12 Displaying Registered User Name

Description: Here is the displaying registered user name after registered the data owner.

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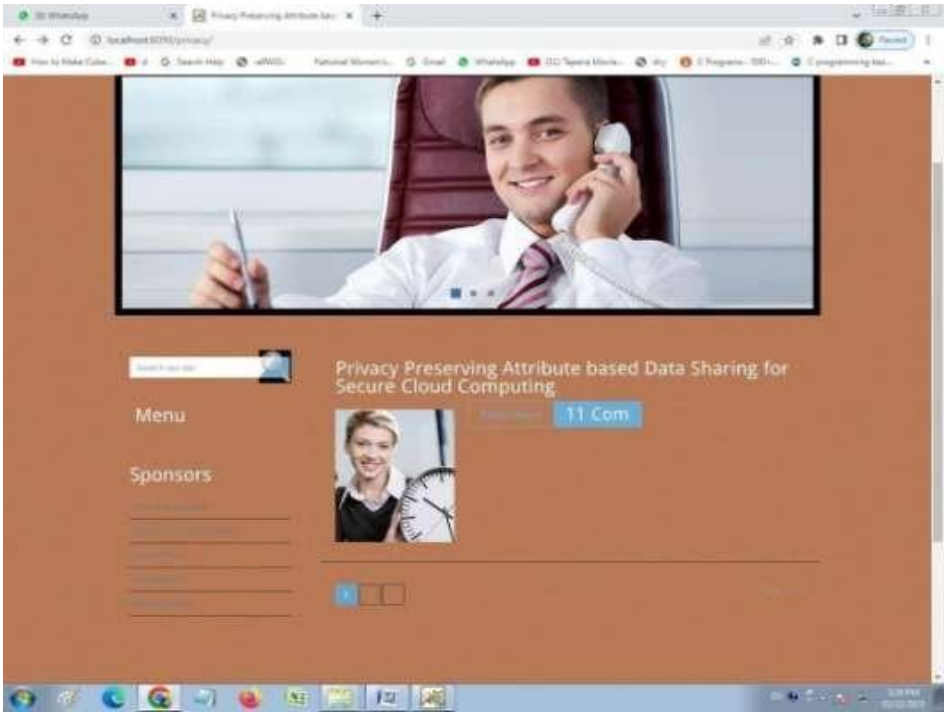
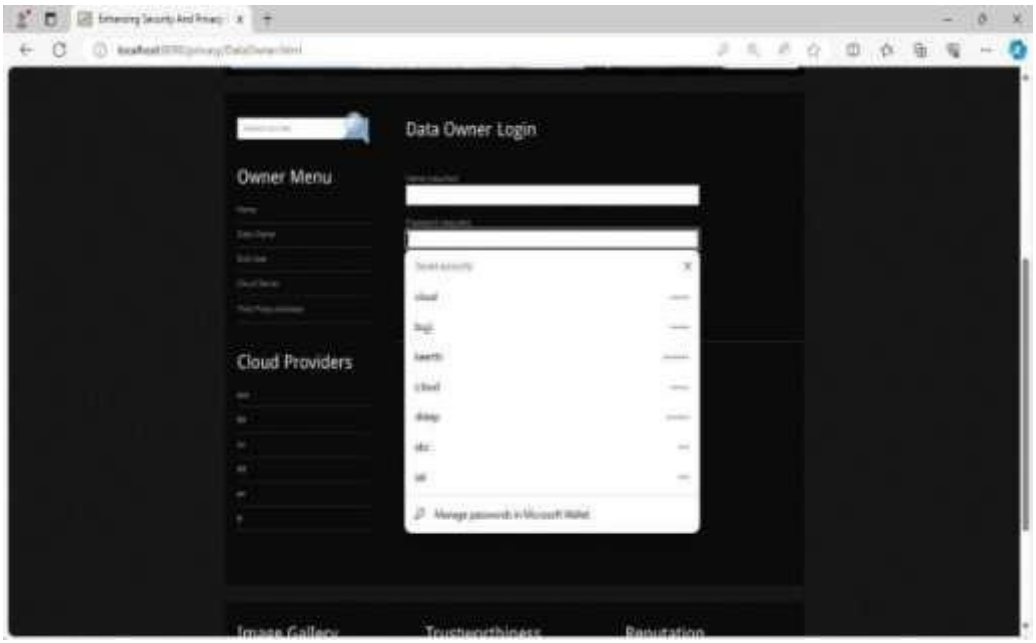
Returned to Home Page



Screen 5.2.13 Returned to Home Page

Description: Return to home page.

Data Owner Login Page



Screen 5.2.14 Data Owner Login Page

Description: To login the data owner page to upload the data into the cloud.

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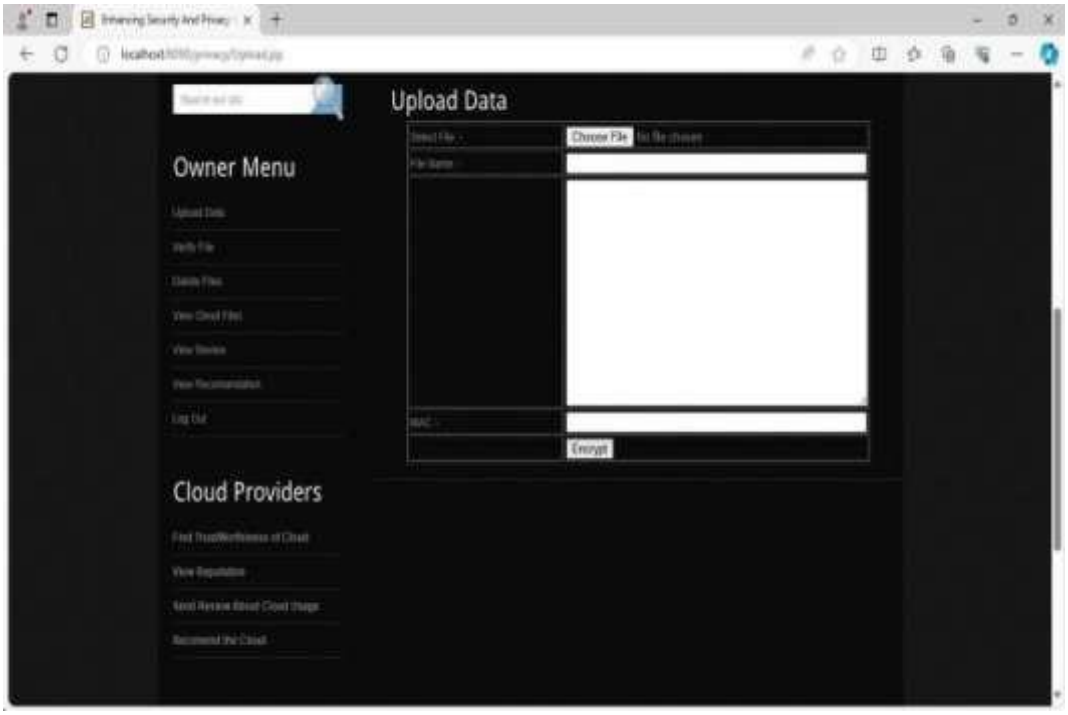
Screen showing Welcome To Data Owner

Screen 5.2.15 Screen showing Welcome To Data Owner

Description: After login the data owner page , then display the screen showing welcome to data owner.

Choosing File To Upload Data



Screen 5.2.16 Choosing File To Upload Data

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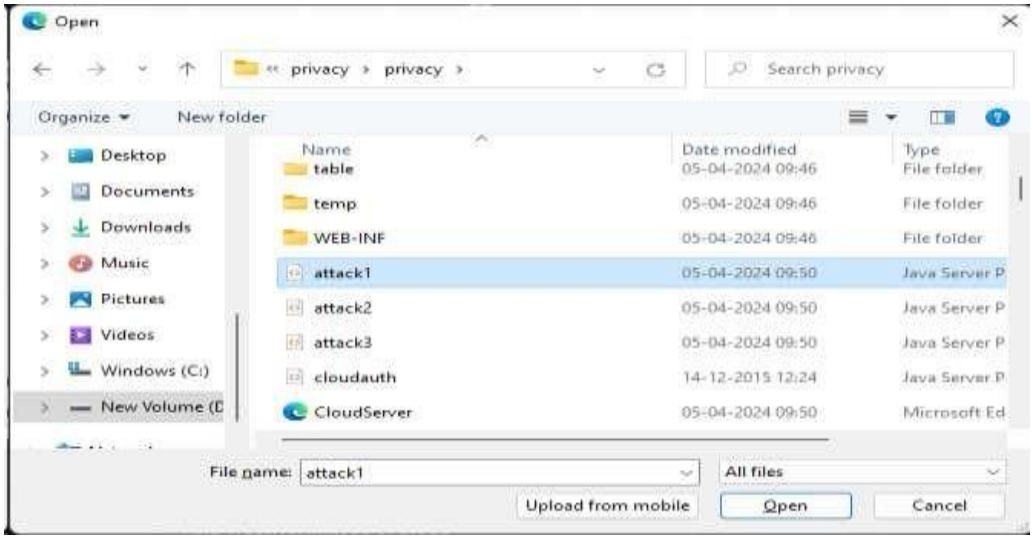
Description: Choose the file to upload the data into the cloud.

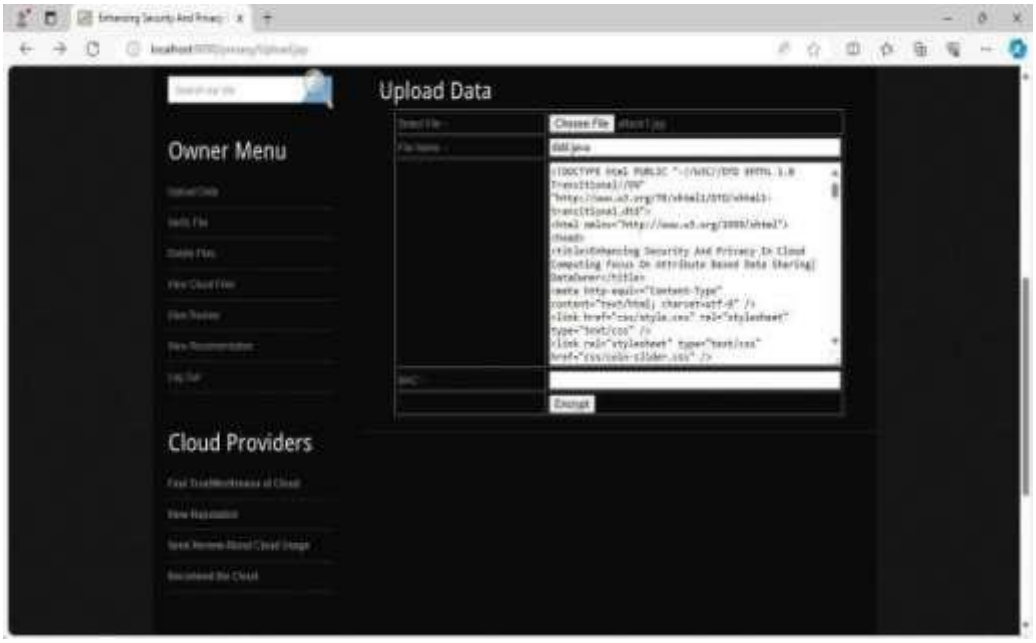
Selection of Attack



Screen 5.2.17 Selection of Attack

Description: To select the file to upload the data.

Screen showing Uploaded Data



Screen 5.2.18 Screen showing Uploaded Data

Description: After upload the data, screen showing the uploaded data. Then click the encrypt.

Data Uploaded Successfully

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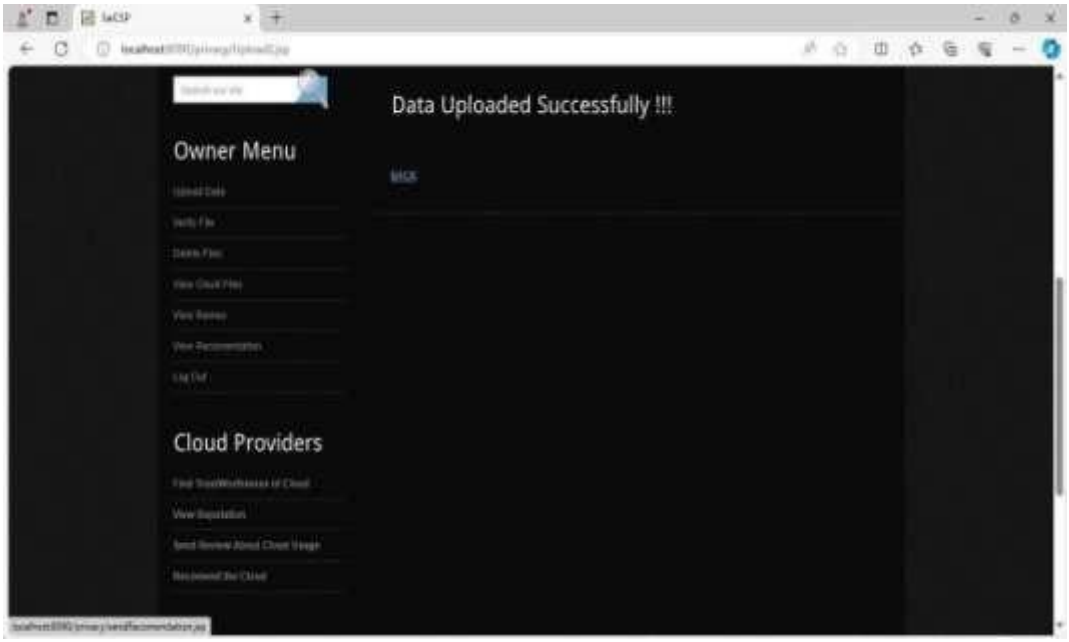

Screen 5.2.19 Data Uploaded Successfully

Description: Data will be uploaded successfully in the cloud.

CONCLUSION

Conclusion

we introduce a new method called linear secret sharing with multiple values, which can greatly improve the expression of access policy. Moreover, each attribute is divided into two parts, namely the attribute name and its value. Therefore, the most obvious advantage of the proposed scheme is that sensitive attribute values can be hidden. And it can protect users' privacy well in PHR. In the proposed scheme, the size of public parameters is constant and the cost of the decryption is only two pairing operations.

Future Enhancement

In on going research work, we propose scheme introduces several key enhancements, including fine-grained access control through Cipher policy Attribute-Based Encryption (CPABE), allowing precise management of who can access data based on their attributes. To ensure data integrity and fairness, the scheme incorporates mechanisms that prevent manipulation during the sharing process. Additionally, it provides auditability and verifiability, allowing users to verify the correctness of data exchanges. Finally, the scheme is designed to be both secure and computationally efficient, making it suitable for large-scale cloud environments.

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7. BIBLIOGRAPHY

Appendix-A URL Listing

Websites	Data collected
https://wikipedia.org	Searching of any information that will be used in documentation.
https://dev.sqlserver.com/doc	SQL server it performing in mainly depending on the one of the database using.
https://www.answers.com	Answers.com, online dictionary, encyclopedia and much more.
https://google.co.in	Any information searching and downloading.
https://training-classes.com	Designing part information as gathered.

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[5] Algorithms".International Journal of Advanced Scientific Innovation, vol. 1, no. 1, Dec. 2020, doi:10.5281/zenodo.4641686.
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Appendix-B

GLOSSARY o GUI : Graphical User Interface o UML : Unified Modeling Language o API : Application Programming Interface o HTML : Hyper Text Markup Language o URL : Uniform Resource Locator o ODBC : Open Database Connectivity

Appendix-C

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Appendix-D Coding

MAIN.JSP

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0
Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1- transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<title>Enhancing Security And Privacy In Cloud Computing Focus On
Attribute Based Data Sharing |index</title>
<meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
<link href="css/style.css" rel="stylesheet" type="text/css" />
<link rel="stylesheet" type="text/css" href="css/coin-slider.css" />
<script type="text/javascript" src="js/cufon-yui.js"></script> <script type="text/javascript" src="js/droid_sans_400- droid_sans_700.font.js"></script>
<script type="text/javascript" src="js/jquery-1.4.2.min.js"></script>
<script type="text/javascript" src="js/script.js"></script>
<script type="text/javascript" src="js/coin-slider.min.js"></script>
</head>
<body>
<div class="main">
  <div class="header">
    <div class="header_resize">
      <div class="menu_nav">
        <ul>
          <li class="active"><a href="index.html"><span>Home
Page</span></a></li>
          <li><a href="DataOwner.html"><span>Data Owner
</span></a></li>
          <li><a href="CloudServer.html"><span>Cloud Server </span></a></li>
        </ul>
      </div>
      <div class="logo">
        <h1><a href="index.html"><span></span> <small>Enhancing
Security And Privacy In Cloud Computing Focus On Attribute Based Data Sharing</small></a></h1>
      </div>
      <div class="clr"></div>
      <div class="slider">
        <div id="coin-slider"> <a href="#"><img src="images/slide1.jpg" width="940" height="336" alt="" /> </a> <a href="#"><img src="images/slide2.jpg" width="940" height="336" alt="" /> </a> <a href="#"><img src="images/slide3.jpg" width="940" height="336" alt="" /> </a> </div>
        <div class="clr"></div>
```

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```
    </div>
    <div class="clr"></div>
   </div>
  </div>
  <div class="content">
   <div class="content_resize">
    <div class="mainbar">
     <div class="article">
      <h2>Enhancing Security And Privacy In Cloud Computing Focus On Attribute Based Data Sharing</h2>

      <div class="clr"></div>
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      <div class="post_content">

       <p class="spec"><a href="#" class="rm">Read more</a> <a href="#" class="com"><span>11</span> Com</a></p>
      </div>
      <div class="clr"></div>
     </div>
     <p class="pages"><small>Page 1 of 2</small> <span>1</span> <a href="#">2</a> <a href="#">&raquo;</a></p>
    </div>
    <div class="sidebar">
     <div class="searchform">
      <form id="formsearch" name="formsearch" method="post" action="#">
       <span>
       <input name="editbox_search" class="editbox_search" id="editbox_search" maxlength="80" value="Search our ste:" type="text" />
       </span>
       <input name="button_search" src="images/search.jpg" class="button_search" type="image" />
      </form>
     </div>
     <div class="clr"></div>
     <div class="gadget">
      <h2 class="star"><span> Menu </span></h2>
      <div class="clr"></div>
      <ul class="sb_menu">

      </ul> </div>
     <div class="gadget">
      <h2 class="star"><span>Sponsors</span></h2>
```

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```
<div class="clr"></div>
<ul class="ex_menu">
  <li><a href="http://www.dreamtemplate.com/">Trust &amp;amp;
Reputation</a></li>
  <li><a href="http://www.templatesold.com/">Service Level
Agreement,</a></li>
  <li><a href="http://www.imhosted.com/">Competence</a></li>
```

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Secure Cloud Computing

Transparency
Relational Risk

<h2>Image Gallery</h2>

<h2>Trustworthiness</h2>

Trustworthiness is computed from ratings obtained through either direct interaction or feedback. Competence is estimated from the transparency of SLA guarantees.
Trust and reputation are important concepts in Internetbased applications.

<h2>Reputation</h2>
Reputation system has been classified into two types : centralized and distributed depending on the site of computation. In centralized type, a central authority (reputation center) collects all the ratings, computes a reputation score for every participant

</body>

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```
</html>
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0
Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1- transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<title>Enhancing Security And Privacy In Cloud Computing Focus On
Attribute Based Data Sharing| Owner </title>
<meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
<link href="css/style.css" rel="stylesheet" type="text/css" />
<link rel="stylesheet" type="text/css" href="css/coin-slider.css" />
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src="js/droid_sans_400- droid_sans_700.font.js"></script>
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<body>
<div class="main">
  <div class="header">
    <div class="header_resize">
      <div class="menu_nav">
        <ul>
          <li><a href="index.html"><span>Home Page</span></a></li>
          <li class="active"><a href="DataOwner.html"><span>Data Owner</span></a></li>

          <li><a href="blog.html"><span>Cloud Server</span></a></li>

        </ul> </div>
      <div class="logo">
        <h1><a href="index.html"><span> </span> <small>Enhancing
Security And Privacy In Cloud Computing Focus On Attribute Based Data Sharing</small></a></h1>
      </div>
      <div class="clr"></div>
      <div class="slider">
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href="#"><img src="images/slide2.jpg" width="940" height="336" alt="" /> </a> <a href="#"><img
src="images/slide3.jpg" width="940" height="336" alt="" /> </a> </div>
        <div class="clr"></div>
      </div>
      <div class="clr"></div>
```

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```
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</div>
<div class="content">
  <div class="content_resize">
    <div class="mainbar">
      <div class="article">
        <h2><span>Data Owner Login </span></h2>
        <div class="clr"></div>
        <p> <form action="ownerauths.jsp" method="post" id="leavereply">
          <ol>
            <li>
              <label for="name">Name (required)</label>
              <input id="name" name="userid" class="text" />
            </li>
            <li>
              <label for="email">Password (required)</label>
              <input type="password" id="pass" name="pass" class="text" /> </li>
                                <li>
              <label for="cname">Select Cloud Server (required)</label>
              <select id="s1" name="cname" style="width:480px;" class="text">
                <option>--Select--</option>
                <option>CS1</option>
                <option>CS2</option>
                                                        <option>CS3</option>
                                                        <option>CS4</option>
              </select>
            </li>
            <li></li>
            <li><br />
                <a href="Register.html">REGISTER</a>
                <input type="submit" name="imageField" id="imageField" class="LOGIN" />
            </li>
          </ol>
        </form></p>
      </div>
    </div>
    <div class="sidebar">
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```
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  <input name="editbox_search" class="editbox_search" id="editbox_search" maxlength="80" value="Search our ste:" type="text" />
  </span>
  <input name="button_search" src="images/search.jpg" class="button_search" type="image" />
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  <li><a href="#">Data Owner</a></li>
  <li><a href="#">End User</a></li>
  <li><a href="#">Cloud Server</a></li>
  <li><a href="#">Third Party Arbitrator</a></li>

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<h2>Image Gallery</h2>

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</body>

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Attribute Based Data Sharing| Owner </title>

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<link rel="stylesheet" type="text/css" href="css/coin-slider.css" />

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<script type="text/javascript" src="js/cufon-yui.js"></script> <script type="text/javascript" src="js/droid_sans_400- droid_sans_700.font.js"></script>
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<script type="text/javascript" src="js/script.js"></script>
<script type="text/javascript" src="js/coin-slider.min.js"></script>
</head>
<body>
<div class="main">
  <div class="header">
    <div class="header_resize">
      <div class="menu_nav">
        <ul>
          <li><a href="index.html"><span>Home Page</span></a></li>
          <li class="active"><a href="DataOwner.html"><span>Data Owner</span></a></li>

          <li><a href="blog.html"><span>Cloud Server</span></a></li>

        </ul> </div>
      <div class="logo">
        <h1><a href="index.html"><span> </span> <small>Enhancing
Security And Privacy In Cloud Computing Focus On Attribute Based Data Sharing</small></a></h1>
      </div>
      <div class="clr"></div>
      <div class="slider">
        <div id="coin-slider"> <a href="#"><img src="images/slide1.jpg" width="940" height="336" alt="" /> </a> <a href="#"><img src="images/slide2.jpg" width="940" height="336" alt="" /> </a> <a href="#"><img src="images/slide3.jpg" width="940" height="336" alt="" /> </a> </div>
        <div class="clr"></div>
      </div>
      <div class="clr"></div>
    </div>
  </div>
  <div class="content">
    <div class="content_resize">
      <div class="mainbar">
        <div class="article">
          <h2><span>Data Owner Login </span></h2>
          <div class="clr"></div>
          <p> <form action="ownerauths.jsp" method="post" id="leavereply">
            <ol>
```

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```
<li>
  <label for="name">Name (required)</label>
  <input id="name" name="userid" class="text" />
</li>
<li>
  <label for="email">Password (required)</label>
  <input type="password" id="pass" name="pass" class="text" /> </li>
                    <li>
  <label for="cname">Select Cloud Server (required)</label>
  <select id="s1" name="cname" style="width:480px;" class="text">
    <option>--Select--</option>
    <option>CS1</option>
    <option>CS2</option>
                                        <option>CS3</option>
                                        <option>CS4</option>
  </select>
</li>
<li></li>
<li><br />
    <a href="Register.html">REGISTER</a>
    <input type="submit" name="imageField" id="imageField" class="LOGIN" />
</li>
</ol>
</form></p>
</div>
</div>
<div class="sidebar">
<div class="searchform">
<form id="formsearch" name="formsearch" method="post" action="#">
<span>
<input name="editbox_search" class="editbox_search" id="editbox_search" maxlength="80" value="Search our
ste:" type="text" />
</span>
<input name="button_search" src="images/search.jpg" class="button_search" type="image" />
</form>
</div>
<div class="clr"></div>
<div class="gadget">
<h2 class="star"><span>Owner Menu </span></h2>
```

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```
<div class="clr"></div>
<ul class="sb_menu">
  <li><a href="#">Home</a></li>
  <li><a href="#">Data Owner</a></li>
  <li><a href="#">End User</a></li>
  <li><a href="#">Cloud Server</a></li>
  <li><a href="#">Third Party Arbitrator</a></li>

</ul> </div>
<div class="gadget">
  <h2 class="star"><span>Cloud Providers </span></h2>
  <div class="clr"></div>
  <ul class="ex_menu">
    <li><a href="http://www.dreamtemplate.com/">aas</li>
    <li><a href="http://www.templatesold.com/">bb</li>
    <li><a href="http://www.imhosted.com/">cc</li>
    <li><a href="http://www.megastockphotos.com/">dd</li>
    <li><a href="http://www.evrsoft.com/">ee</li>
    <li><a href="http://www.csshub.com/">ff</li>
  </ul>
 </div>
</div>
<div class="clr"></div>
</div>
</div>
<div class="fbg">
 <div class="fbg_resize">
  <div class="col c1">
   <h2><span>Image</span> Gallery</h2>
   <a href="#"><img src="images/gal1.jpg" width="75" height="75" alt="" class="gal" /></a> <a href="#"><img
src="images/gal2.jpg" width="75" height="75" alt="" class="gal" /></a> <a href="#"><img src="images/gal3.jpg"
width="75" height="75" alt="" class="gal" /></a> <a href="#"><img src="images/gal4.jpg" width="75" height="75"
alt="" class="gal" /></a> <a href="#"><img src="images/gal5.jpg" width="75" height="75" alt="" class="gal" /></a>
<a href="#"><img src="images/gal6.jpg" width="75" height="75" alt="" class="gal" /></a> </div>
  <div class="col c2">
<h2><span>Trustworthiness</span></h2>
<p>
Trustworthiness is computed from ratings obtained through either direct interaction or feedback. Competence is estimated from the transparency of SLA guarantees.
```

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Trust and reputation are important concepts in Internetbased applications.

<h2>Reputation</h2>

Reputation system has been classified into two types : centralized and distributed depending on the site of computation. In centralized type, a central authority (reputation center) collects all the ratings, computes a reputation score for every participant

</body>

</html>

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