Project

ON

" Collaborative File Sharing Using File Manager Over Object Storage "

IS SUBMITTED TO

SANT GADGE BABA AMRAVATI UNIVERSITY

IN THE PARTIAL FULFILLMENT OF THE DEGREE OF

BACHELORS OF ENGINEERING

IN

COMPUTER SCIENCE AND ENGINEERING

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2018-2019

1. INTRODUCTION

According to the changes in technology there is vast need of data sharing and data storage working across different platforms. To overcome this technological challenge there is a need of File sharing system which is safe, secure and platform.

The aim of this project is to provide a cloud based file sharing systems which implement object storage system to increases the security of uploaded documents.

Cloud file sharing, also called cloud-based file sharing or online file sharing, is a system in which a user is allotted storage space on a server and reads and writes are carried out over the Internet.

1. Brief Description of the project

The aim of the project is to provide Cloud file sharing end users the ability to access files with any Internet-capable device from any location. Usually, the user has the ability to grant access privileges to other users as they see fit. Although cloud file sharing services are easy to use, the user must rely upon the service provider ability to provide high availability (HA) and backup and recovery in a timely manner.

In the enterprise, cloud file sharing can present security risks and compliance concerns if company data is stored on third-party providers without the IT department's knowledge. Object storage essentially bundles the data itself along with metadata tags and a unique identifier. The metadata is customizable, which means you can input a lot more identifying information for each piece of data. These objects are stored in a flat address space, which makes it easier to locate and retrieve your data across regions.

This flat address space also helps with scalability. By simply adding in additional nodes, you can scale to petabytes and beyond. Security will be achieved through the AES algorithm.[Posted by: Margaret Rouse, WhatIs.com].The Advanced Encryption Standard, or AES, is a symmetric block cipher chosen by the U.S. government to protect classified information and is implemented in software and hardware throughout the world to encrypt sensitive data .The National Institute of Standards and Technology (NIST) started development of AES in 1997 when it announced the need for a successor algorithm for the Data Encryption Standard (DES), which was starting to become vulnerable to brute-force attacks.

This new, advanced encryption algorithm would be unclassified and had to be "capable of protecting sensitive government information well into the next century," according to the NIST announcement of the process for development of an advanced encryption standard algorithm. It was intended to be easy to implement in hardware and software, as well as in restricted environments (for example, in a smart card) and offer good defenses against various attack techniques.

This project provides a secure online file sharing platform through which a user can access his documents along with those documents whose access is allotted to him by the other user through this file sharing system user can upload documents in a secured location, user can retrieve these documents anytime from any internet enabled device. User can access its information and manage the access permissions to other users using the platform. The documents uploaded are encrypted and backed up to another location so there is no threat of integrity and loss of the document. The System is very useful for governments, companies, hospitals and people who require a safe repository for their important documents and share it safely with other authorized person. The system is designed to fulfill all the requirements of the person wanting to share important documents with other users.

2. Literature Review

In older Days when we wanted to share a document with many people we had to send that file personally to each and every person which wasted lots of our efforts and time for uploading the same document again and again which was time consuming. The integrity and security and availability of important documents was also an issue.

2.1 Cloud Computing

Cloud computing is internet-based computing where by shared resources, software and Information are provided to computers and other devices on-demand, like the electricity grid. Cloud computing is a culmination of numerous attempts at large-scale computing with seamless access to virtually limitless resources.

On-demand computing, utility computing, ubiquitous computing, autonomic computing, platform computing, edge computing, elastic computing and grid computing. A number of characteristics define cloud data, applications services and infrastructure:

Remotely hosted: Services or data are hosted on a remote infrastructure.

Ubiquitous: Services or data are available from anywhere.

Commoditized: The result is a utility computing model similar to traditional
                 Utilities like gas and electricity; you pay for what you need!

Cloud Computing = Software as a Service + Platform as a Service + Infrastructure as service.
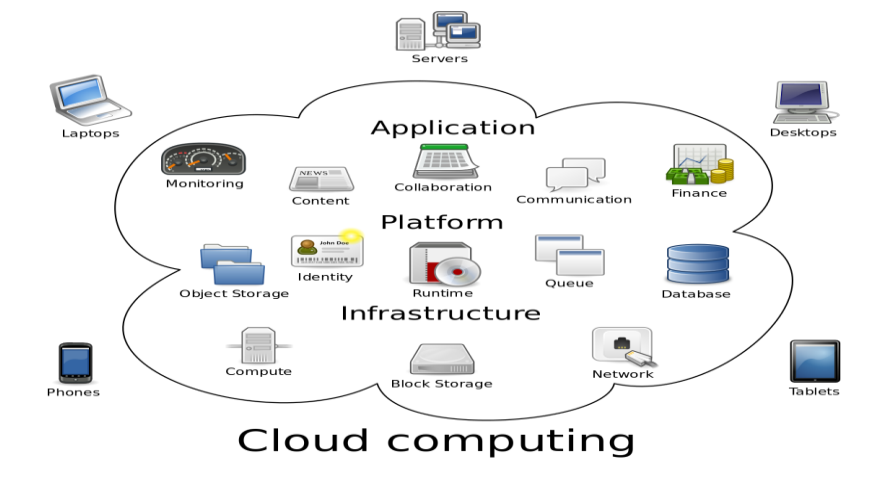
Fig. 1: Cloud computing

2.2 Advanced Encryption Standard (AES)

Advanced Encryption Standard (AES) is a Symmetric key cryptography and it is an iterated block cipher with a fixed block size of 128 bit and a variable key length i.e. it may be 128, 192 or 256 bits.

For generating key for AES

KeyGenerator keygen=KeyGenerator.getInstance ("AES");

AES for static data security

National Security Agency (NSA) strength of all key length of AES algorithm (i.e.128, 192 and 256) is sufficient to protect classified information up to the secret level. Top secret information will require use of either the b192 or 256 key lengths. The high speed up is obtained in AES symmetric encryption algorithm for low sizes; the speed-up fall sharply as the input sizes is increased.

KeyGeneratorKeygen=KeyGenerator.getInstance ("AES")

In block sizes=cipher.getBlockSize ();

Byte in byte []=new byte[block size];

Desired features of AES used:

✓ Security

✓ Performance

✓ Simplicity

✓ Flexibility

Designers: Vincent rijment, Joan daemen

First published: 1998

Key sizes: 128,192 or 256 bits

Block size: 128 bits

Structure: substitution-permutation network

Round: 10, 12, or 14(depending on key size)

Key size	Time to Crack
56-bit	399 seconds
128-bit	1.02×10^{18} years
192-bit	1.872×10^{37} years
256-bit	3.31×10^{56} years

Table 1 : Key sizes of AES

1. In the sub bytes step, each byte in the states is replaced with its entry in a fixed 8-bit lookup tables; bij=S (aij).
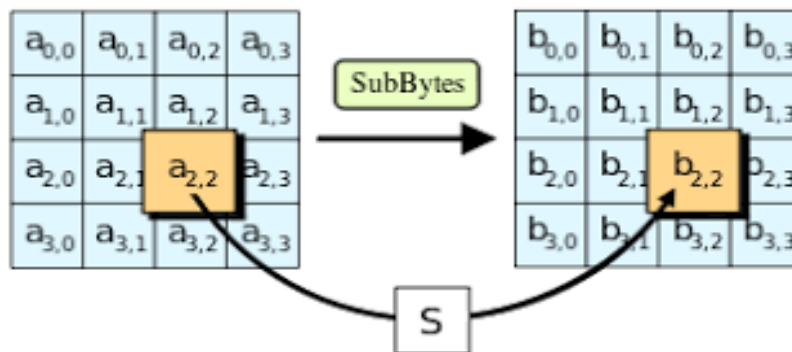

Fig. 2 : Sub byte transformation

2.In shift row step, bytes in each row of the state are shifted cyclically to the left. The number of places each byte is shifted differs for each row.
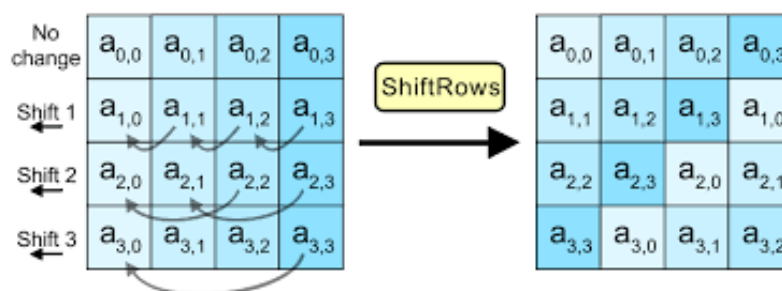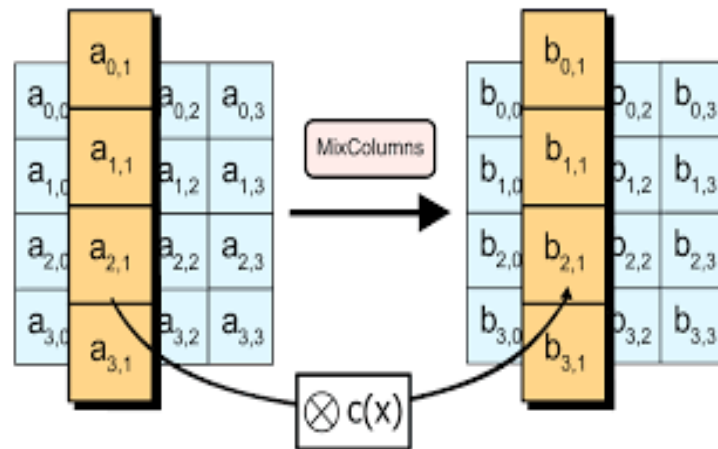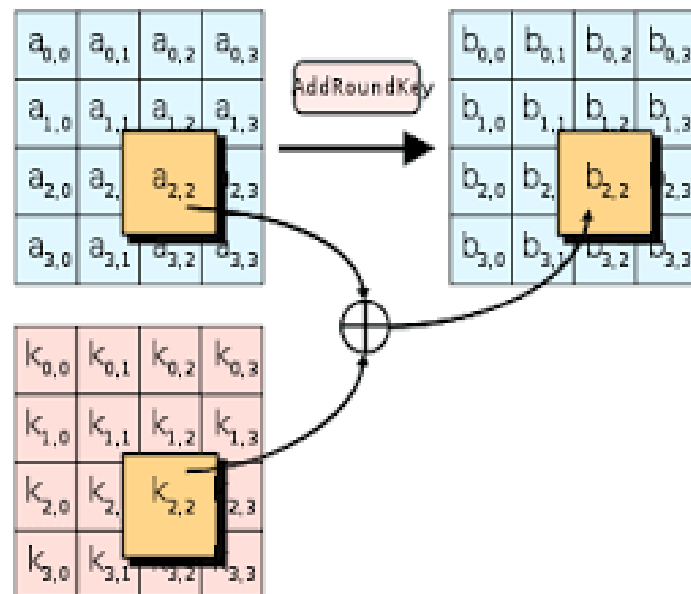

Fig. 3: Shift rows

3. In mix column step, each column on each state is multiplied with fixed polynomial c(x).

Fig. 4 : Mix column

4. In add round key step, each byte of the state is combine with byte of round sub key using the XOR operation.

Fig. 5 : Add round key

3 . Proposed Work

The work of the program will linger around the three basic objectives, as this three objectives are self-sufficient for achieving entire goal.

1) To develop a cloud based file sharing system

2) To implement object storage system

3) To increase the security and availability of the uploaded documents

Before starting the main work the whole concept will start by building an user friendly interface in terms of website this will be the first module during the whole work.

The list of modules is stated as below:

- Admin panel

- User management

- Document Sharing

- Encryption

- Decryption

Let us discuss each module briefly one after another,

1) **Admin panel**:
Admin panel will be used for the monitoring purpose, First the Admin of the system will login through his specified ID and Password through a particularly designed website using Visual Studio 2017.

Admin will be solemnly dependent for the View object storage capacity and make a spontaneous observation over the occupied space and space left a free.

2) **User management**:
1. *Registration and login*: The user management section will be specifically based on the user services and user interaction.

Whenever the new user want to use our services user first have to fill the registration form where user will fill his essential details. After successful registration and agreeing on the stringent terms and services user will be redirected to the login panel where he will fill respective id and password to login to his account.

2. *Change password*: It provides the forgot password and the change password option for the end user.

3. *Upload document*: The most crucial feature for which user are much more interested is document uploading, where user will upload there data on the cloud servers which amassing the object storage structure.

4. *View own documents and Share documents*: Provides the feature of accessing own documents and then by sharing ir using the cloud storage.

5. *Download documents*: Document downloading is the power given to the user with which the user will be able to download specific files by a authentication and after verifying user details.

6. *Access permission management*: This section will include flow of control over the access of the specific data.

3) **Document sharing**:

The situation in which two or more people use the internet or a piece of software to access a document at the same time: The software package includes fax, electronic mail, document sharing, and easy access to the internet computer network.

We live in a world where chasing the information that you need has become increasingly an herculean task. So a document sharing software provides the technologies, tools, and methods used to capture, manage, store, deliver and dispose of 'documents' across an enterprise. It makes your documents work for you instead of you working hard to organize and manage your documents.

The cloud storage plays the key role in document sharing where the data is uploaded on the one cloud server and all the used access the data directly from server with specific authentication.

Cloud file sharing, also called cloud-based file sharing or online file sharing, is a system in which a user is allotted storage space on a server and reads and writes are carried out over the Internet.

4) **Encryption**:

Encryption is the process of encoding a message or information in such a way that only authorized parties can access it and those who are not authorized cannot. Encryption does not itself prevent interference, but denies the intelligible content to a would-be interceptor. In an encryption scheme, the intended information or message, referred to as plaintext, is encrypted

using an encryption algorithm – a cipher – generating cipher-text that can be read only if decrypted. For technical reasons, an encryption scheme usually uses a pseudo-random encryption key generated by an algorithm

5) **Decryption**:

Decryption is generally the reverse process of encryption. It is the process of decoding the data which has been encrypted into a secret format. An authorized user can only decrypt data because decryption requires a secret key or password.

Decryption is the process of decoding encrypted information so that is can be accessed again by authorized users.

4. Analysis of Problem

Online File Sharing is practice of sharing files among different users across the internet. Common forms of file sharing are FTP (File Transfer Protocol) model and P2P (Peer-to-Peer) file sharing network. Another common form of sharing files over the internet is for a user to upload files to a website and allow other users to download them from the website. There are a lot of issues to consider when developing such a website.

Users of an online file sharing website who use features like upload, download, share, search, etc. would want a website that is very interactive and fast and not annoying with a lot of post backs and flashing screens. The users requirements such as the security of data and ease of access right owner must be full filled. Specific algorithms must be designed to meet this requirements. As the rate of amount data is booming constantly that arises big question mark about the new storage management strategies.

Another important issue to consider is the location where the website stores the uploaded files. Two places where one can store the uploaded files are Database and Cloud Servers. The data security must ensure the backup system by using which data can be retrieved in case of any cyber-attack incidence .if the security is being compromised the data recovery option must be available. Another issue is the visualization of their file system where usually users have a limit to upload files. The normal web based file folder view would be good, but if there are other types of visualizations it would be great. file storage faces many of the limitations.

Think of file storage as a warehouse. When you first put a box of files in there, it seems like you have plenty of space. But as your data needs grow, you'll fill up the warehouse to capacity before you know it. Object storage, on the other hand, is like the warehouse, except with no roof. You can keep adding data infinitely – the sky's the limit. With block storage, files are split into evenly sized blocks of data, each with its own address but with no additional information (metadata) to provide more context for what that block of data is. You're likely to encounter block storage in the majority of enterprise workloads; it has a wide variety of uses (as seen by the rise in popularity of SAN arrays).

According to researches, Object storage, by contrast, doesn't split files up into raw blocks of data. Instead, entire clumps of data are stored in, yes, an object that contains the data,

metadata, and the unique identifier. There is no limit on the type or amount of metadata,which makes object storage powerful and customizable. Metadata can include anything from the security classification of the file within the object to the importance of the application associated with the information.

Anyone who's stored a picture on Facebook or a song on Spotify has used object storage even if they don't know it. In the enterprise data center, object storage is used for these same types of storage needs, where the data needs to be highly available and highly durable.

In the present world of communication, one of the necessary requirements to prevent data theft is securing the information. Security has become a critical feature for thriving networks and in military alike. Cryptography is a well-known and widely used technique that manipulates information (messages) in order to cipher or hide their existence. These techniques have many applications in computer science and other related fields: they are used to protect military messages, E-mails, credit card information, corporate data, personal files, etc. When we send confidential matter from one client to another or from client to server then, that any unauthorized user should not intercept data. This may be further worse when a captain in the war field is sending some message to a soldier over the mail to move to some place to attack the enemy and assume that the message is been intercepted by some enemy. It means whenever we want to send some message to someone that should be encrypted in such a way that no one can decrypt without knowing the key for the decryption process.

5. System Design

The design of an information system produces the details that clearly describe how a system will meet the requirement identified during system analysis. System analysts begin the design process by identifying reports and other outputs system will produce.

Designers select file structures and storage devices. Such as magnetic disk. Magnetic tape or even paper files. Procedures they write tell how to process the data and produce the output.

Design phase is often divided into two separate phases:

System design : Systems design is the process of defining the architecture, modules, interfaces, and data for a system to satisfy specified requirements. Systems design could be seen as the application of systems theory to product development. There is some overlap with the disciplines of systems analysis, systems architecture and systems engineering.

Systems design implies a systematic approach to the design of a system. It may take a bottom-up or top-down approach, but either way the process is systematic wherein it takes into account all related variables of the system that needs to be created—from the architecture, to the required hardware and software, right down to the data and how it travels and transforms throughout its travel through the system. Systems design then overlaps with systems analysis, systems engineering and systems architecture.

Detailed design: During detailed design focus is on specification of the internal logic for each of the modules or components.

Main flow of project :
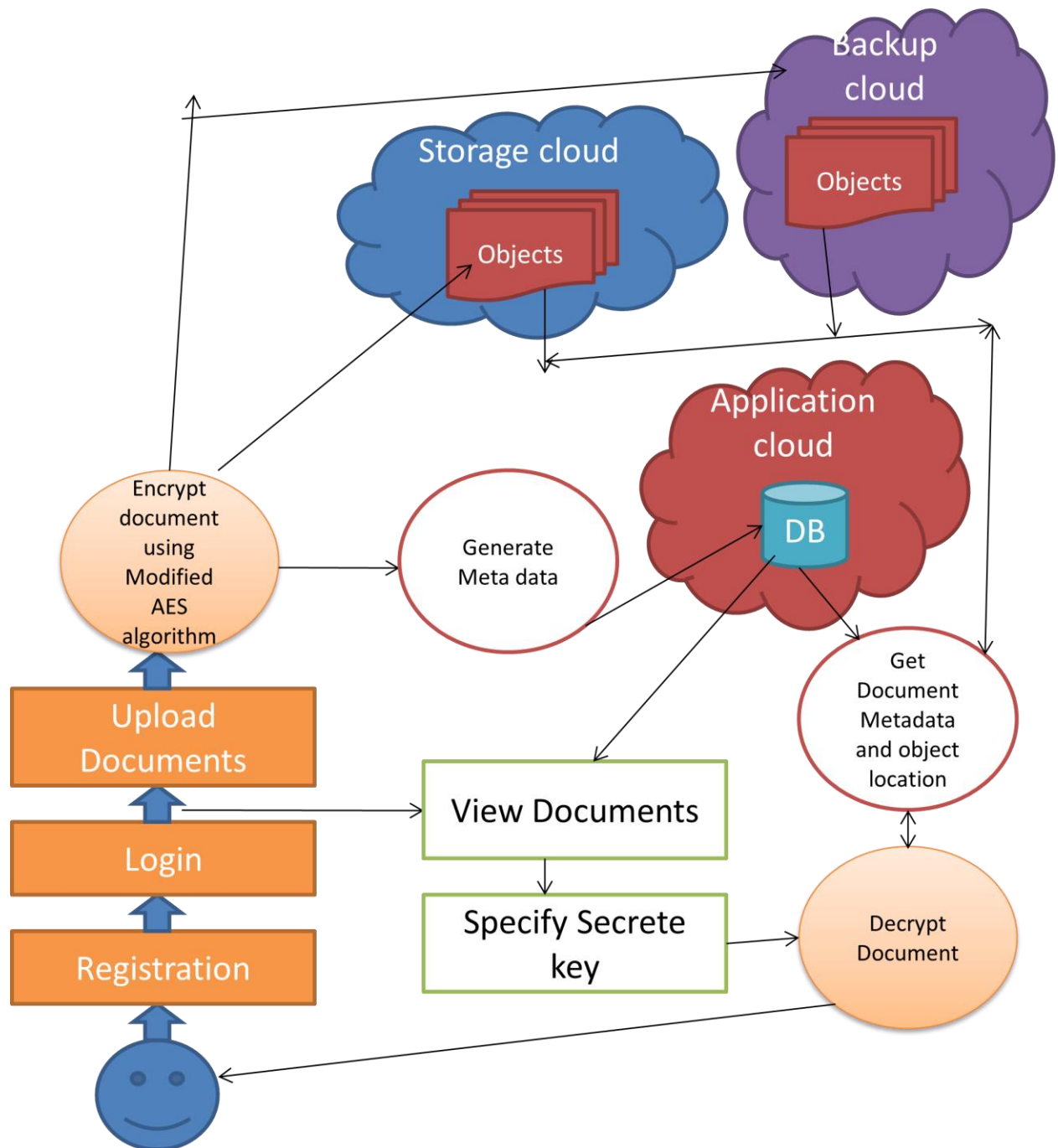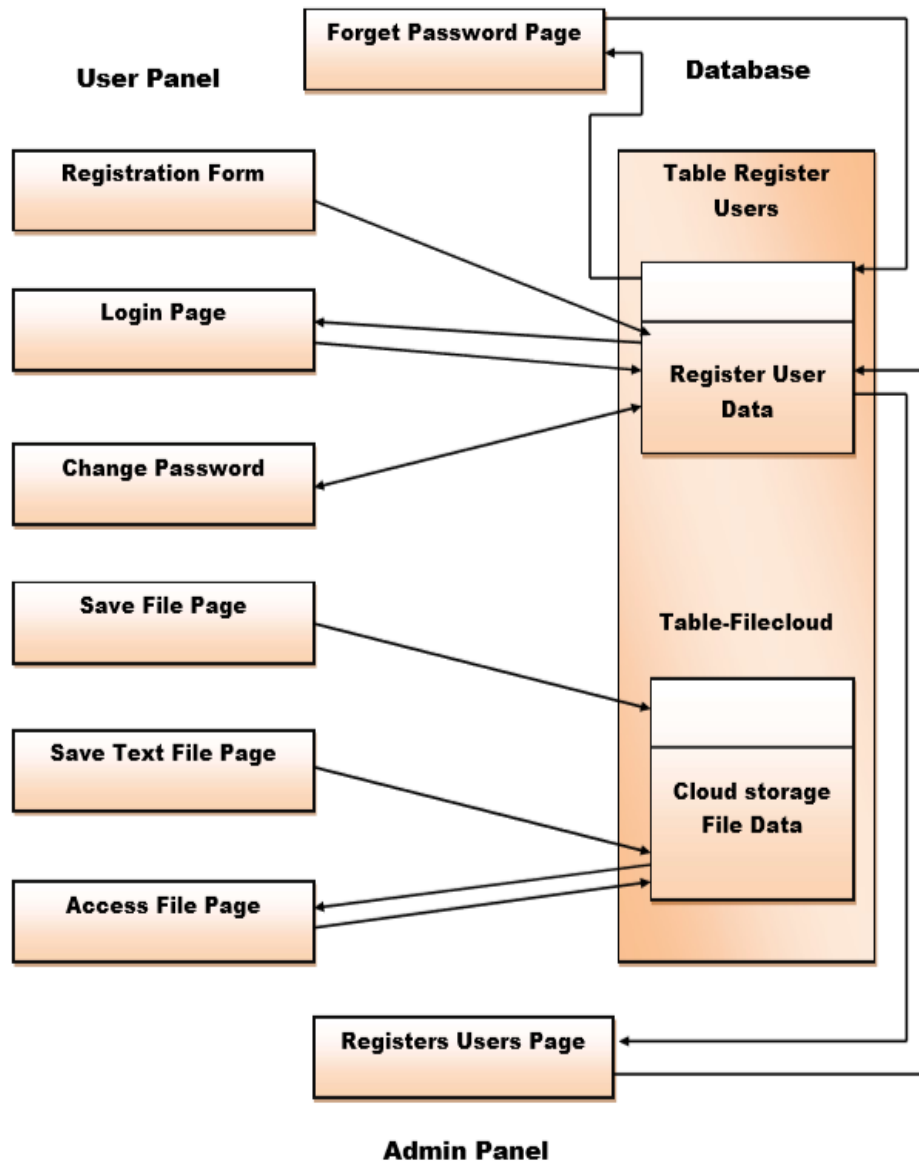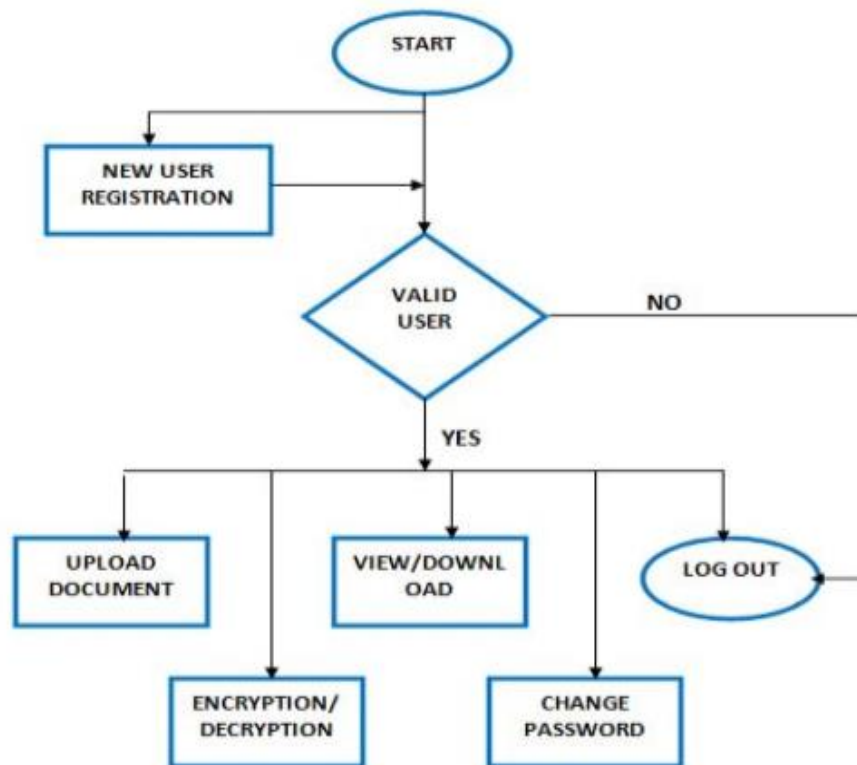

Fig. 6 : Main flow of project

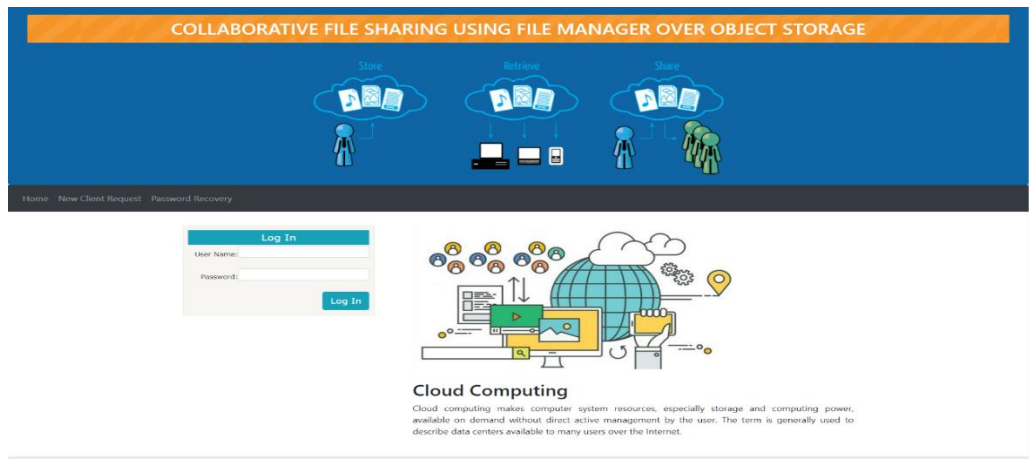**Data Flow Diagram :**

Fig. 7 : Data flow diagram

User Login :

Fig. 8 : User login

6. Implementation

6.1 Login Page :

The page shown below is the Home page. This is the first page of our project. In this home page we have links of four pages: 1. Home 2. New Client Request 3. Password Recovery 4. Log In. By selecting this links user can do sign up, login for uploading documents.

Screenshot 1 : Login page

6.2 New Client Request Page :

External user can send a request to admin for creating new account   by entering information 1. Client Name, 2. Contact Number, 3. Email Id, 4. Date of Birth, 5.Security Question, 6. Answer of security Question, 7.Profile picture. After click on submit button request will be send to the admin

Screenshot 2 : New client request page

6.3 Admin Home Page :

The page shown below is the Admin Home page. In this home page we have links of seven pages: 1. Home, 2. Client Users, 3. Cloud Services, 4. Cloud Usage, 5. Cloud Payments, 6. Client Account, 7. Logout .
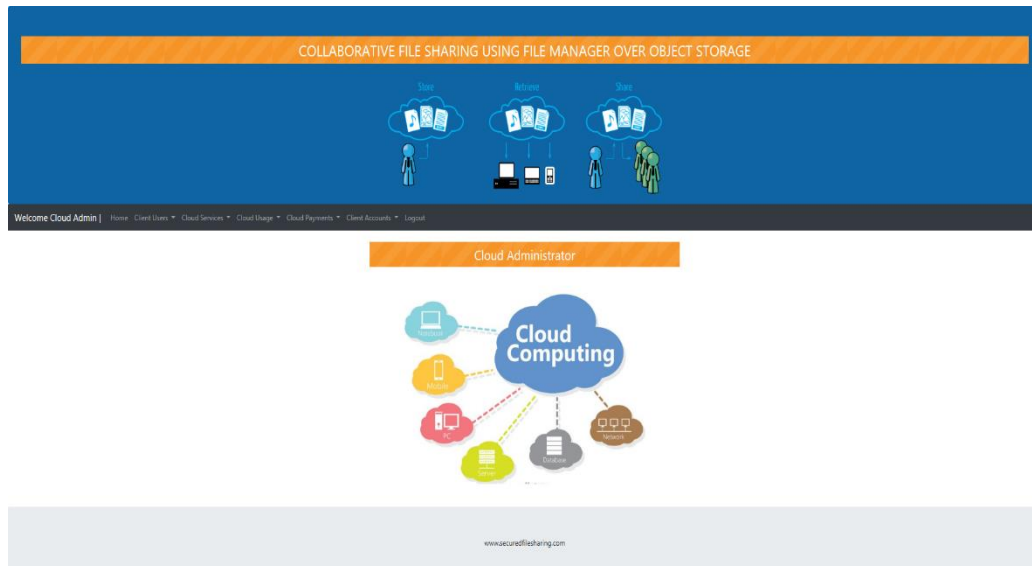
**Screenshot 3 : Admin home page**

6.4 User Home Page :

After entering correct credentials user will be redirected to the user home page. In this home page we have links of seven pages: 1. Home, 2. My Profile, 3. Manage Document, 4. Cloud Service, 5.Cloud Usage, 6. Cloud Payment, 7. Logout.
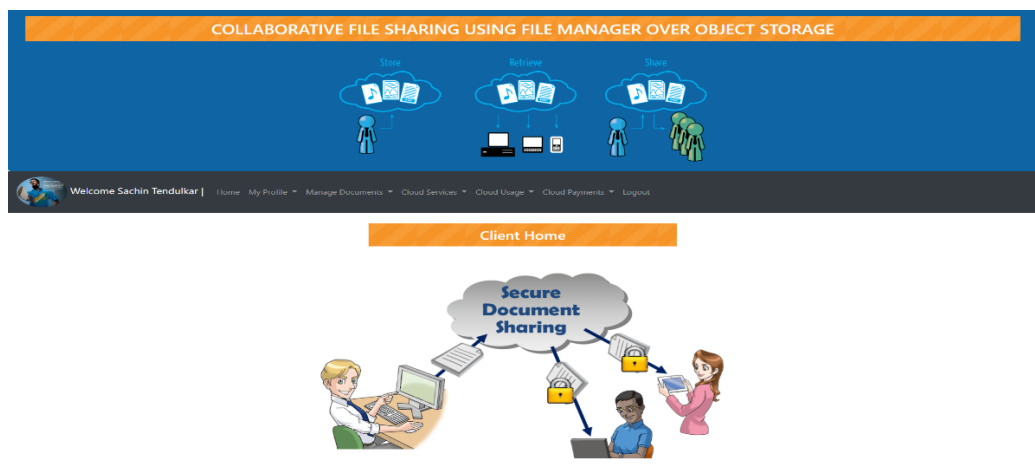
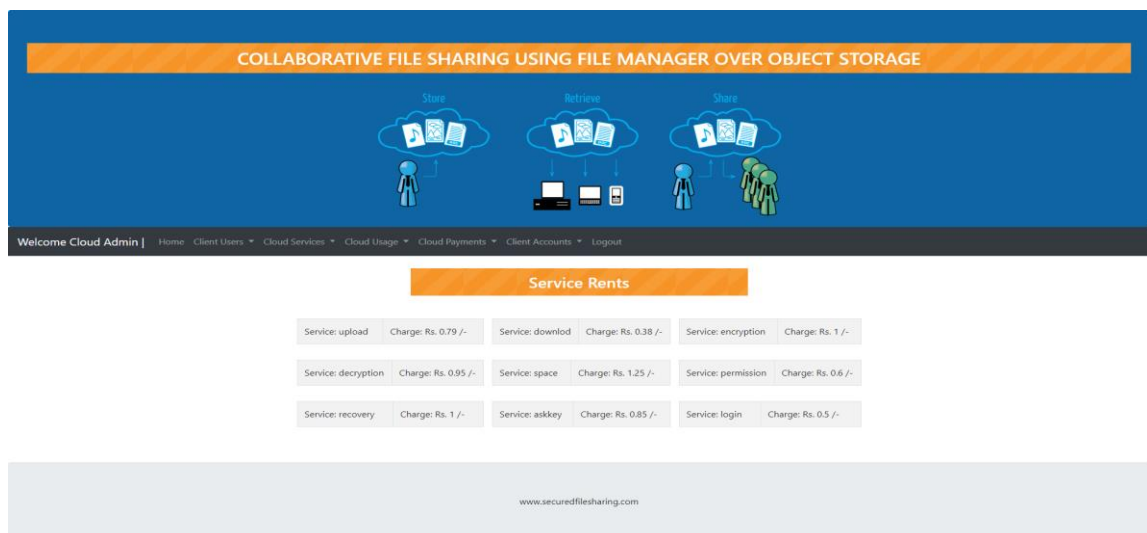**Screenshot 4 : User home page**

6.5 Approve Request (By Admin) :

After submitting new account request by user admin will approve the request through this page.
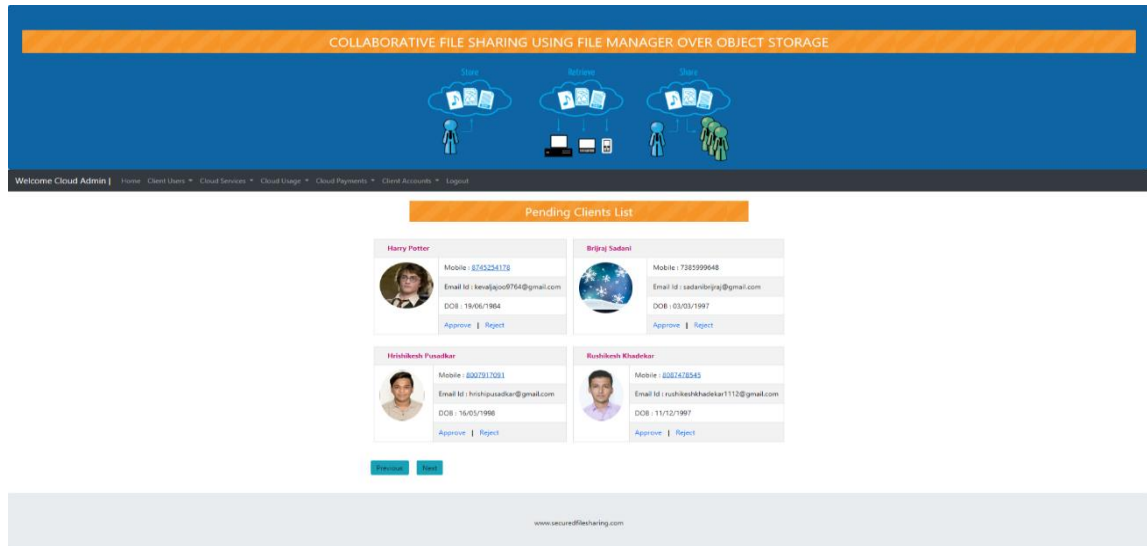
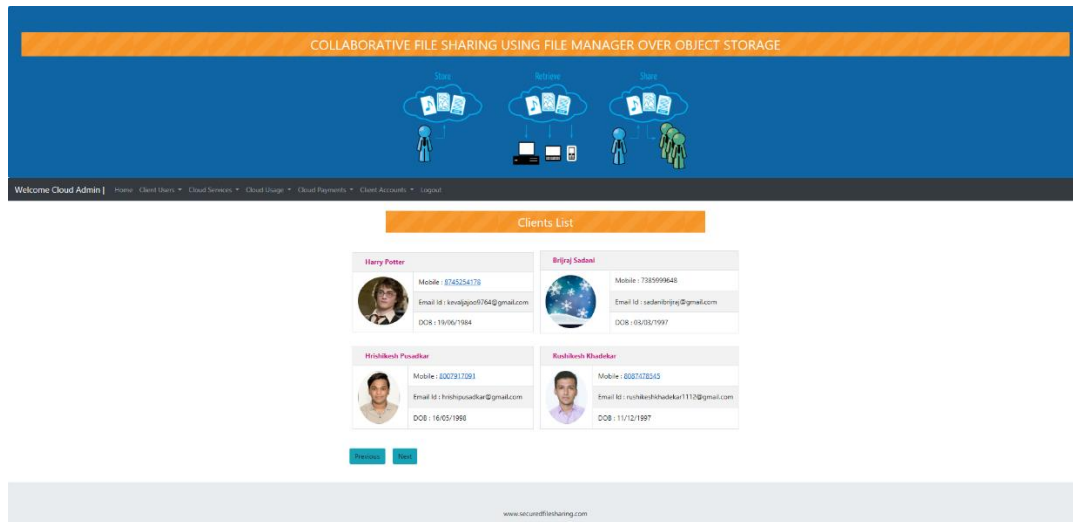**Screenshot 5 : Approve request**

6.6 Service Rent :

This page displays the rent assigned for each service in the sharing system.

Screenshot 6 : Service rent
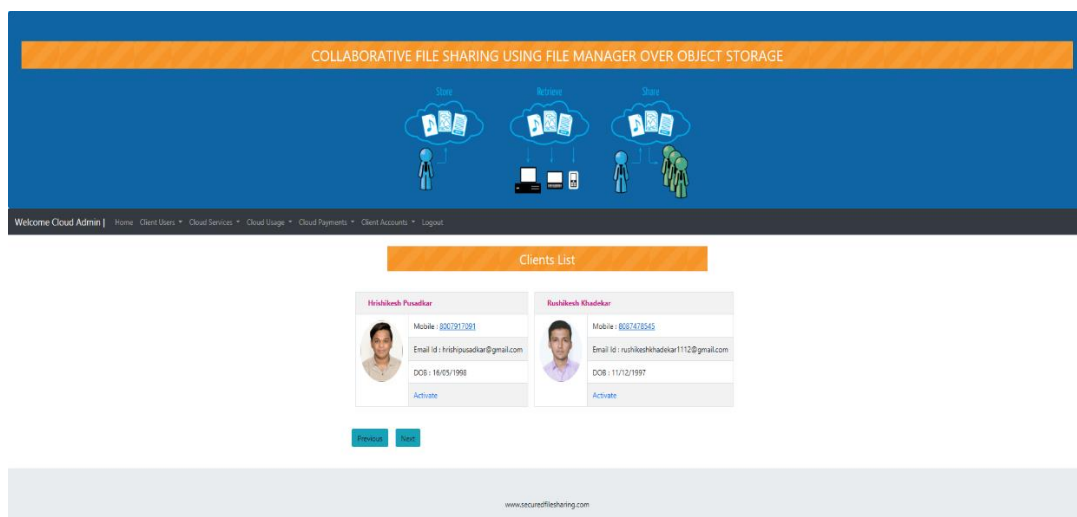
6.7 Activate Account :

This page allows the admin to activate the account creation request submitted by the user and it also allows to activate the account which is deactivated by admin.

Screenshot 7 : Activate account
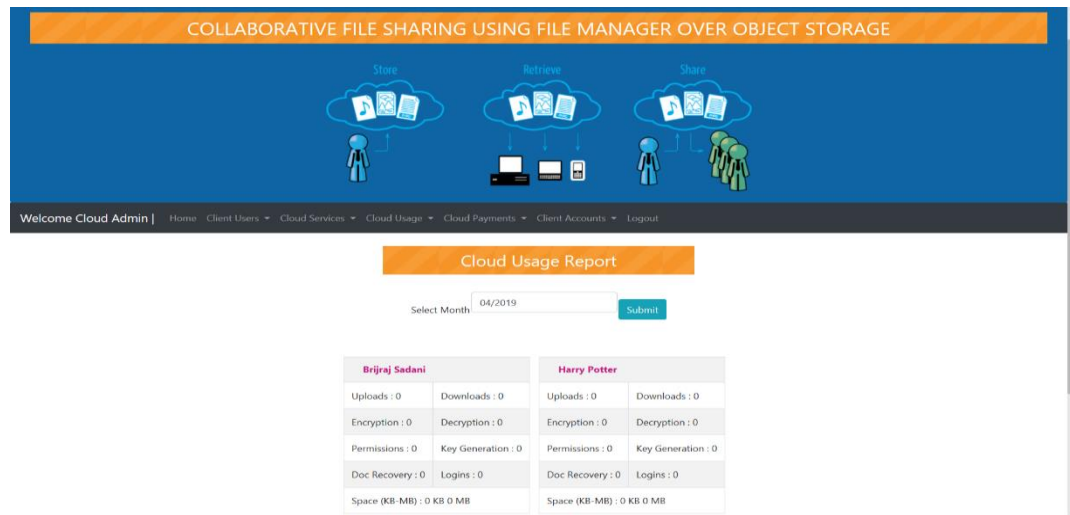
6.8 Deactivate Account :

If user doesn't pay the rent on time then Admin can deactivate the account the user account by using this page.

Screenshot 8 : Deactivate page

6.9 Cloud Usage Report :

In this page admin can see the Usage report of all clients. ie. How many times client uses the services and how many space use form cloud.

Screenshot 9 : Cloud usage report

6.10 Upload Document :

In this page client put the information about the document which he wants to store on the cloud and upload that document by using this page.

Screenshot 10 : Upload document

6.11 Download File :

If users wants to download file from cloud the users have to enter the Secrete key to send on mail id at the time of the saving the file on folder.

Screenshot 11 : Download File

6.12 Password Recovery :

You will see a link on the login page saying " Password Recovery ". If you accidently forget your password then you don't have to worry just click on that link and you will see these form. On this, you to enter your User Id, security question and answer and click on " Submit " option and tou will get an email. On your email account of your valid current password.

Screenshot 12 : Password recovery

6.13 Change Password :

In this page user can change their old password by new one as a security of their Profile. Also, user can logout their account by simply clicking on "Logout".

Screenshot 13 : Change password

7. Software and hardware

7.1 Software Required

• MS SQL Server

• Visual Studio

• Operating system windows 8.1(Supported in windows 10 also)

7.2 Hardware Required

• Hard Disk: 3.5GB or above

• RAM: 2.83MB or above

• Intel core i3 processor

7.3 Technology Used

• Deployment Platform: Windows

• Web Server: IIS, ASP.NET development server

• Development Technology (Server side): ASP.NET

• Language: C#

• Component Programming: DLL, C# component classes

• Database technology: ADO.NET

• Web Development:

7.4 Tools Required :

7.4.1 Front End Tool

• **What is ASP.NET**

ASP.NET is a web development platform, which provides a programming model, comprehensive software infrastructure and various services required to build up robust web applications for PC as well as mobile devices.ASP.NET works on the top of the HTTP protocol and uses HTTP commands and policies to set a browser-to server bilateral communication and co-operation ASP.NET is a part of Microsoft.Net platform. ASP.NET applications are compiled codes, written using the extensible and reusable components or objects present in .Net framework. These codes can use the entire hierarchy of classes in .Net framework. ASP.NET application codes can be written in any of the following languages:

- C#
- Visual Basic.Net
- JavaScript

ASP.NET is used to produce interactive, data-driven web applications over the internet. It consists of a large number of controls such as text boxes, buttons, and labels for assembling, configuring, and manipulating code to create HTML pages.

- **ASP.NET Web Forms Model**

ASP.NET web forms extend the event-driven model of interaction to the web applications. The browser submits a web form to the web server and the server returns a full markup page in response. All client-side user activities are forwarded to the server for tasteful processing. The server processes the output of the client actions and triggers the reactions. Now, HTTP is a stateless protocol. ASP.NET framework helps in storing the information regarding the state of the application, which consists of:

a. Page state b. Session state

- **ASP.NET Component Model**

The ASP.NET component model provides various building blocks of ASP.NET pages. Basically, it is an object model, which describes:

a. Server-side counterparts of almost all HTML elements or tags such as <form> and <input>.

b. Server controls, which help in developing complex user-interface. For example, the Calendar controls or the Grid view control.

- **Components of .Net Framework 3.5**

Before going to the next session on Visual Studio .Net, let us go through the various components of the .Net framework 3.5. The following table describe the components of the .Net 3.5 and the job they perform:

- **Components and their Description**
1. Common Language Runtime of CLR It performs memory management, exception handling, debugging, security checking, thread execution, code execution, code safety, verification, and compilation. The code that is directly managed by the CLR is called the managed code. When the managed code is compiled, the compiler converts the source code.

2. Net Framework Class Library It contains a huge library of reusable type, classes, interfaces, structures and enumerated values, which are collectively called types.
3. Common Language Specification It Contains the specification for the .NET supported languages and implementation of language integration.
4. Common Type System It provides guidelines for declaring, using, and managing types at runtime and cross-language communication.
5. Windows forms Contain the graphical representation of any window displayed in the application.
6. Windows Presentation Foundation It provides a separation between the user interface and the business logic. It helps in developing visually stunning interfaces using documents, media, two and three-dimensional graphics, animations and more.

7.4.2 Back End Tool

- **SQL Server 2008**

SQL is structured Query Language, which is a computer language for storing, manipulating and retrieving data stored in relational database. SQL is the standard language for Relational Database System. All relational database management system like MySQL, MS Access, Oracle, Sybase, Informix, postures and SQL Server use SQL as standard database language.

- **Why SQL:**
  - Allows users to access data in relational database management system.
  - Allows user to describe the data.
  - Allows user to define data in database and manipulate that data.
  - Allows to embed within other languages using SQL modules, libraries & precompilers.
  - Allows user to create and drop database and tables.
  - Allows user to create view, stored procedure, functions in a database.
  - Allows user to set permission on tables, procedures and views.

- **SQL Process:**

When you are executing an SQL command for any RDBMS, the system determines the best way to carry out your request and SQL engines figures out to interpret the task. There are various components included in the process. These components are Query Dispatcher, Optimization Engines, etc. Classic query engine handles all non-SQL queries, but SQL query engine won't handle logical files.

- **SQL Commands:**

The standard SQL commands to interact with relational database are CREATE, SELECT, INSERT, UPDATE, DELETE and DROP. The3se commands can be classified into groups Based on their nature.

- **Data Definition Language:**

Command	Description
1.CREATE	Create table, view the table in the database.
2.ALTER	Modifies an existing object, such as a table.
3.DROP	Delete a table.

Table 2 : Data Definition Language

- **Data Manipulation Language**:

Command	Description
1.INSERT	Create a record.
2.UPDATE	Modifies record.
3.DELETE	Deletes record.

Table 3 : Data Manipulation Language

- **Data Control Language:**

Command	Description
1.GRANT	Gives a privilege to user.
2.REVOKE	Takes back privilege granted from user.

Table 4 : Data Control Language

- **Data Query Language:**

Command	Description
1.SELECT	Retrieves certain records from one or more tables.

Table 5 : Data Query Language

8. SOFTWARE TESTING

8.1 Need For Testing:

Testing was essential for the following reasons:-

- Existence of program defects of inadequacies.
- The software behavior as intended by its designer.
- Conformance with requirement specification/ user need .
- Access of the operational reliability of the system.
- Check whether the software is really useful.
- Find the output fault, which cause the output anomaly.

8.2 Integration Testing:

Integration testing is defined as the testing of combined parts of an application to determine if they function correctly. These "design items" ,i.e. assemblages (or group of units),are exercised through their interface using black box testing, success and error cases being simulated via appropriate parameter and data input.

Software integration testing is performed according to the Software Development Life Cycle (SDLC) after module and functional test. The cross dependencies for testing are: Schedule for integration testing, strategy and selection of the tools for integration, define cyclomatical complexity of the software architecture, reusability of modules and life cycle.

8.3 White Box Testing:

White box testing is a method of testing software that test internal structure and working of an application, as opposed to its functionality. White-box testing is also called glass testing or open-box testing.

White box test design technique include the following code coverage criteria :

- Control flow testing
- Data flow testing
- Branch testing
- Statement coverage
- Decision coverage
- Modified condition/ decision coverage
- Prime path testing

8.4 Black Box Testing :

The technique of testing without having any knowledge of the interior workings of the application is called black-box testing. The tester is oblivious to the system architecture and does not have access to the source code. Typically, while performing a black-box test, a tester will interact with the system's user interface by providing inputs and examining outputs without knowing how and where the inputs are worked upon.

8.4.1 Test cases:

Test cases are built around specification and requirements, i.e., what the application is supposed to do. Test cases are generally derived from external description of the software including specification, requirement and design test may also be used.

The test designer selects both valid and invalid inputs and determines the correct output, often with the help of an oracle or a previous result that is known to be good, without any knowledge of the test objects internal structure.

Typical test design techniques include:

- Decision table testing
- All parts testing
- Equivalence partitioning
- Boundary value analysis
- Cause effect graph
- Error guessing.

9. Conclusion

- This project will provide a secure platform for storing files to the online cloud and will reduce the overloading of the cloud resources and increased efficiency of cloud.

- An interactive file sharing website with very few page refreshes was developed using ASP.NET 2.0, Visual studio 2017 and SQL Server 2016 as the back end.

- After deploying the object storage system following properties are established successfully:

1. Scalability

Object storage is known for its compatibility with cloud computing, and that's because of its unlimited scalability. Thanks to its flat structure, object storage doesn't have the same limitations as file or block storage. Object storage can easily scale data to petabytes without restrictions.

2. Faster Data Retrieval and Better Recovery

Each object in the storage environment has its own identifying details, comprised of metadata and ID number, which the OS reads to retrieve data. Without the need to sift through file structures, retrieval is much faster. Thanks to the metadata and ID numbers, users don't need to know an object's exact location to retrieve it.

3. Fewer Limitations

Compared to the traditional file or block-based systems, object storage is far less limited because it's not organized in a hierarchy. Because of its flat data environment, object storage provides a kind of access that other storage systems can't allow.

4. Cost-effectiveness

For organizations who need to store large amounts of data, an object-based system could be the most cost-effective. Because it scales out much easier than other storage environments, it's less costly to store all your data.

10. Future scope

Cloud computing deliberately focuses on the way which provides the flawless data sharing and data storage concept. The future scope of cloud computing will revolve around the some definite facts given below:

The line between what is cloud and what is not cloud are blurring:

- Most of the traditional infrastructure is moving to dynamic, virtualized resources on leased environments, meaning they look increasingly like cloud.for example: dedicated servers.
- Organizations are realizing that the values of the cloud is in agility and outsourcing at scale – and not in cost

  One way to think about cloud is like a ZipCar: you can get a car quickly by the hour at a low cost and you don't have to worry about insurance and other costs. Yet no one drives a ZipCar to work. If you know you will need a car every day it makes better financial sense to own one.

- Cloud purchasing will become more strategic

  Three years ago, companies would look at American Express to tell them how much their employees were spending on Amazon. A thousand here, a thousand there, it adds up quickly. Now they are getting costs under control. CIOs and CFOs have had a bit of sticker shock.

- The Value drivers of cloud are shifting

  Today cloud is ahead. It's the de-facto standard for most startups. If you care about having the latest and greatest features, cloud is the way to go. They have built an incredible ecosystem of partners, management and monitoring tools implementation partners and managed service providers that represent a clear competitive advantage.

- Going up the application mass strategically
- Bringing the center of data mass onto cloud for transaction data.
- The sudden surge in data demand as the higher involvement of smart digital cites
- Which will create the need of large amount of data transfer and storage on the blink.

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