

A Project Report on

Expeditious Banking using Block-chain Technology

Submitted in partial fulfillment of the requirements for the award
of the degree of

Bachelor of Engineering

in

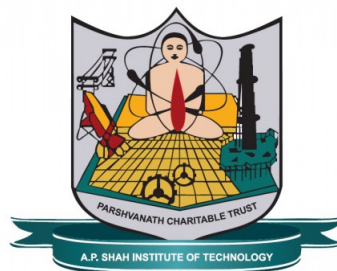
Information Technology

by

Varsha Naik(16104054)
Riya Pejavar(16104040)
Rishabh Singh(14104017)

Under the Guidance of

Prof.Anagha Aher
Prof.Sneha Kanchan



Department of Information Technology

A.P. Shah Institute of Technology
G.B.Road,Kasarvadavli, Thane(W), Mumbai-400615
UNIVERSITY OF MUMBAI

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Approval Sheet

This Project Report entitled “*Expeditious Banking Using Block-chain Technology*” Submitted by “*Varsha Naik*”(16104054), “*Riya Pejaware*”(16104040), “*Rishabh Singh*”(14104017) is approved for the partial fulfillment of the requirement for the award of the degree of *Bachelor of Engineering in Information Technology* from *University of Mumbai*.

Prof.Sneha Kanchan
Co-Guide

Prof.Anagha Aher
Guide

Prof. Kiran Deshpande
Head Department of Information Technology

Place:A.P.Shah Institute of Technology, Thane
Date:

CERTIFICATE

This is to certify that the project entitled “*Expeditious Banking using Blockchain Technology*” submitted by “*Varsha Naik*” (16104054), “*Riya Pejawar*” (16104040), “*Rishabh Singh*” (14104017) for the partial fulfillment of the requirement for award of a degree *Bachelor of Engineering in Information Technology*, to the University of Mumbai, is a bonafide work carried out during academic year 2019-2020.

Prof. Sneha Kanchan
Co-Guide

Prof. Anagha Aher
Guide

Prof. Kiran Deshpande
Head Department of Information Technology

Dr. Uttam D. Kolekar
Principal

External Examiner(s)

1.

2.

Place: A.P. Shah Institute of Technology, Thane

Date:

Declaration

We declare that this written submission represents our ideas in our own words and where others' ideas or words have been included, We have adequately cited and referenced the original sources. We also declare that We have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

(Signature)

(Varsha Naik 16104054)
(Riya Pejawar 16104040)
(Rishabh Singh 14104017)

Date:

Abstract

Blockchain is an answer to the question “How can we trust what happens online?” The Blockchain is a distributed database that maintains a list of records these records are called blocks. Each block contains the history of every block with some additional encrypted data which is different at each block level. The Blockchain is maintained by a scalable network of computers(nodes), creating a chain. Blockchain technology was first introduced as the technology behind the Bitcoin, but it is expected that its characteristics of accurate and guarded data transfer in distributed Peer to Peer network could make other applications possible. Blockchain is growing as a potentially out of line force capable of changing the financial services industry by making the fund transfer immediate, cheaper and more secure. Current existing system is not secure enough to give 100 percent fraud protection because of more manual work and lack of security of data. Blockchain is nothing but a chain made of blocks (nodes). These process node does the all major work. These blocks are connected to each other using cryptography. This system will be more expeditious, more efficient, and has user affectional interfaces in the banking and has zero probability of losing data while processing of the user data. In integration to enabling trade, block chain is larceny and tamper resistant model, it eliminates errors and the duplication, blockchain is ideal for reserving the data in blocks and using a tamper proof hash format, so the data can be securely stored by the bank and make the current existing system much more secure and faster which is already done in case of cryptocurrency.

Keywords:- Blockchain, Cryptography, Peer to Peer(P2P) network, Hashing, Cryptocurrency.

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List of Abbreviations

P2P:	Peer to Peer
NEFT:	National Electronic Funds Transfer
IFSC:	Indian Financial System Code
RBI:	Reserve Bank of India
UI:	User Interface
MVC:	Model View Controller
DFD:	Data Flow Diagram
UML:	Unifying Modeling Language
OTP:	One Time Password
JSP:	Java Server Page
PAN:	Permanent Account Number
ER:	Entity Relationship

Chapter 1

Introduction

Blockchain is digital, distributed and public ledger. Blockchain technology was first used in now a days popular cryptocurrency called Bitcoin (virtual currency), but it is expected that its characteristics of accurate and guarded data transfer in distributed peer to peer (P2P) network could make other applications possible. In block-chain nodes are connected in chronological order. The block-chain offers ability to distribute ledgers in decentralized way and that's a key concept. Unlike centralized system where the ledgers of records are stored in single specific entity like a bank or governmental institution, the block-chain shares the ledgers in between its participants. That's what make block-chain decentralized. This means that ledgers are written and stored in network and its members are responsible to update and monitor it. Every block of record is constantly synchronized by the different members of the open network, creating multiple copies of the data through a shared record-keeping system ensuring no single person or an organization holds ownership of data. When an incipient transaction or an edit to a subsisting transaction comes in to a block-chain generally a most of the nodes within a block-chain implementation have to apply steps (algorithm) to calculate and validate and verify the past of the individual block-chain's block that is introduced. When all the node come to an agreement or consensus that history and signature of the transaction is valid then that new particular block is then added to chain of the transaction. If majority of nodes does not agree to the integration in ledger ingress then block is not added to chain. This kind of working allows this block-chain methodology to run without any need of the central authority. In block-chain each block contains number of transactions. It provides a decentralized, immutable data store that can be used across a network of users, engenders assets and acts as a shared ebony book that records all transactions. So, the block-chain establishes an auditable and indisputable open record of information that is cheaper, faster and more secure than any other existing centralized system.

1.1 Project Overview

This project aims to give a powerful network with higher security for the banking sector with one of the latest trending technology as blockchain and changing the way transaction takes place eliminating the third parties and instead of processing as one entire block as the traditional one with replacing them into multiple blocks chained together. Existing banking transaction used to have a third party as a middle man for every transaction, which makes transaction tedious less secure as anyone can temper the data being processed. The proposed web application improves Banking transaction using the blockchain technology with higher level of security using hash function (hash function maps arbitrary size inputs or messages to fixed size hash values or tags) by eliminating centralized ledger that reduces the manual work along with the transaction time.

Chapter 2

Literature Review

A literature survey is a text of a scholarly paper, which includes the current knowledge including substantive findings, as well as theoretical and methodological contributions to a particular topic. Cyber Security with Block-chain have been proposed taking these papers into consideration. This banking system will help us to eliminate the traditional system. Table 2.1 shows the literature survey.

2.1 Existing System

In current world there is a limitation on the banking transaction based on various type of transaction modes such as, when customer do National Electronic Fund Transfer(NEFT) limit is 2 lacs. Few problems with current systems are lack of security of data, more man power, time consuming, consumes high volume of pare work. The real problem starts when there is involvement of manual work because of this there is also chance of human error. When customer do National Electronic Fund Transfer(NEFT) it takes about 10 to 20 minutes to get done because of something called "Clearance Center". It sends the request to pooling centre. The pooling centre gives the message to the clearance Centre to be included for the next batch. The Clearance Centre sorts the funds transfer transactions destination bank-wise and prepares accounting entries to receive funds from the originating banks and give the funds to the destination banks. Also National NEFT only works between 9:00 to 5:00 means during banking hours. The Funds transfer made after 6:30 PM will be presented to Reserve Bank of India(RBI) next day

2.2 Literature Review

Chris Huls, have worked on uses of blockchain in banking and gave major application of this technology in finance which are, Reduction of fraud in bank: Banks currently uses centralized database. Due to this, system is more vulnerable hackers as the information is located in one place. The know your customer will be stored in blockchain so whenever other bank need to verify new customer that bank can directly see that know your customer [1].

Tong Wu and Xiubo Liang, has proposed the typical architecture of blockchain application consists of the application layer, the interface layer, the shared protocol layer, and the shared data layer. There is also mention of X-swap which is launched by the China Foreign Exchange Trade System. The system can automatically refresh the hidden orders and bypass orders [2].

Quoc Khanh Nguyen, has introduced the advantages and of blockchain like Blockchain promotes keenly intellectual contracts, which increases the efficiency of transactions. But also has drawbacks such as it limits the competitiveness between banks to improve their own system as blockchain network will be shared among all banks participated in the system. And incompleteness in terms of legal and regulation on Bitcoin and cryptocurrencies prevents blockchain technology from being widely applied [3].

Konstantinos Christidis and Michael Devetsikiotis, motivated by the recent explosion of interest around block chains, it is examine whether they make a good fit for the Internet of Things sector. Blockchain allow us to have a distributed peer-to-peer network where non-trusting members can interact with each other without a trusted intermediary, in a verifiable manner [4].

Xiwei Xu and Shiping Chen, Liming Zhu, has concluded that cryptocurrency are low-cost, quick, shielded and basically and mostly self-governing of any (not controlled by one central place) authority to move (from one place to another) virtual money or issue new units of money. New units of money are issued by the users of the cryptocurrency through mining by validating transactions. The virtual money can be transferred to users without going through trusted authority to buy products and services in real world [5]

Chapter 3

PROPOSED SYSTEM

This chapter includes a brief description of the proposed system and explores the different modules involved along with the various models through which this system is understood and represented. Here, the proposed system is based on blockchain technology. Basically there are two bank and a transaction will take place between these two banks by using something called NODES. The Nodes are processor. There are two nodes that validates and verifies the user, bank, and transaction between bank, security

3.1 Proposed System Module

The web application will help the bank users to perform the banking transaction more securely and with faster response by eliminating the third parties and the concept of blockchain technology is used which is very power full as compare to other modern world technology. The system includes two main modules User, Admin. User module contains sub-modules such as money transfer, OTP generation, My statement, Add beneficiary. Admin module has viewing of all of the user request and add branch.

3.2 Functional Analysis

Functional analysis is the next step in the systems engineering process after setting goal and requirements. Functional analysis divides a system into smaller parts, called functional elements, which describe what we want each part to do. Following analysis includes authentication and required output. Authentication analysis is about in which manner the web application performs the authentication and make sure that users is what user claims to be

3.2.1 Authentication Analysis

After adding Beneficiary successfully, money can be further transfered to the receiver account after generating One Time Password. At fund transfer, it will validate the user and encrypt with the token assigned and further it will convert the value using JavaScript Object Notation message converter of spring framework and this encrypted packet will be transferred to

NODE 1. At NODE 1 initially the received packet will be decrypted and will be verified if the value is changed or not. If unchanged, then it will further decrypt with the token and process to NODE 2. At this point, the node will verify if user exist in the bank or not and divide with sixteen number token with the multiples of four

3.2.2 Output

If the Beneficiary added successfully, user will further enter the amount to be transferred with the Required Transaction password provided during registration. One time password will be sent to respective mail and money transfer takes place if all nodes successfully transfer the message, and money will be deducted from user account. The receiver will be notified through email, once his account is updated.

3.3 Non-functional Requirement Analysis

Non-functional requirement is a requirement that specifies criteria that can be used to judge the operation of a system, rather than specific behaviors. Functional requirements define what a system is supposed to do and non-functional requirements define how a system is supposed to be. Here is performance of proposed web application like how fast the pages are loading without consuming much resources, safety of the users, security and required design of user interface with respect to users and tools required. In software engineering, such requirements are often called as functional specifications.

3.3.1 Performance Requirement analysis

The blockchain network needs to be tested for performance and latency which would vary based on the size of the network, expected size of transactions, the consensus protocol used and the latency that it might necessitate. The goals of this preliminary performance analysis are twofold. First, a methodology for evaluating a blockchain platform is developed. Second, the analysis results are presented to inform practitioners in making decisions regarding adoption of blockchain technology

3.3.2 Safety Requirements

The user or admin opens the login page and enters the credentials and according to credentials they get directed to their page. Once it happens user need to activate beneficiary if it is not activated already. User is also required to generate one time password(OTP) to transfer the money and to generate that one time password(OTP) user has to enter transaction password that has been given to user when account is first created.

3.3.3 Security Requirements

According to entered credentials user get directed to their respective page. All the access permission for the systems data may only be changed by the bank's administrator. When user registers for first time and opens new account request is received by admin then admin verifies the user's details and if all seems perfect then only admin allows the user and send user the credentials of account. While transferring the money both nodes also check that weather user is valid or not, receivers name is same as account name in his branch.

3.3.4 Design Requirements

The system executes on eclipse photon platform. The system is developed using java programming language and using spring Model, View, and controller(MVC) framework. A spring MVC is a Java framework which is used to build web applications. The model encapsulates the application data. The view is responsible for rendering the model data. The controller is responsible for processing requests and building model.

3.4 System Requirement

To be used efficiently, all computer software needs certain hardware components or other software resources to be present on a computer these prerequisites are known as (computer) system requirements. This section will provide the user the required specification of the hardware and software components on which the proposed system is to be implemented

3.4.1 Hardware Requirement

All computer software needs certain hardware components or other software resources to be present on a computer. The most common set of requirements dened by a software application is the physical computer resources, also known as hardware. These prerequisites are known as system requirements. Table 3.1 shows hardware requirements.

PROCESSOR	Dual core or more
RAM	2GB
Hard Disk	100MB
Internet	2MBPS

3.4.2 Software Requirement

Software requirements deal with dening software resource requirements and prerequisites that need to be installed on a computer to provide optimal functioning of an application. Basic software requirements can be used for browser support, device support their versions

to be used for stability purpose. Table 3.2 shows hardware requirements.

Operating System	Windows xp or later
Web Server	Apache Tomcat
Programming Languages	HTML5, CSS3, java ,SQL, JavaScript.
Database Technology	MySQL
Interface Application	Web Application
Browser Support	Any

3.5 System Architecture

A system architecture can consist of system components and the sub-systems developed, that will work together to implement overall system. The following architecture includes necessary structure to run system. BANK 1, BANK 2, NODE 1, NODE 2.

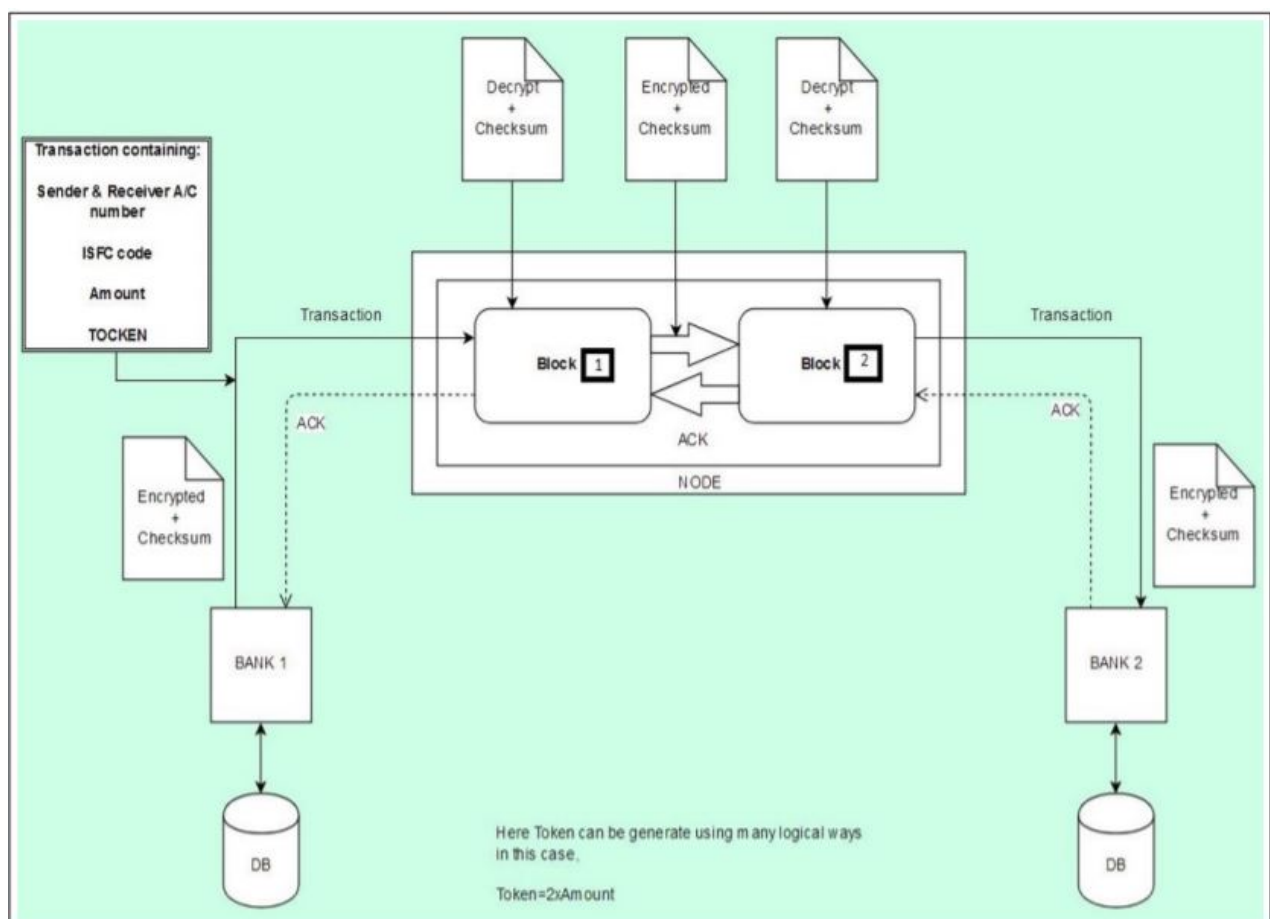


Fig. 1: System Architecture

3.5.1 Bank User

Figure 3.1 shows proposed system architecture. The application consists of the User interface with all the required links and buttons for navigating inside banking application. For sign up user has to provide the personal details like Name, email, PAN. After sign up the user will receive the mail containing the details like login id, login password. Whenever user wants to do the transaction user has to enter transaction password the user can proceed with transaction.

3.5.2 Bank Admin

This part of an application also consists of the User interface with all the required links and buttons for navigating inside banking application. Whenever new user register himself as new customer this request is received by admin, once admin approve this user gets mail of acceptance along with credentials in it. The admin has the ability to accept or reject the service requests of users, he can also add the new branches of his bank into the system

3.5.3 Processing NODE 1

A node is a device on a blockchain network, that is in essence the foundation of the technology, allowing it to function and survive. Nodes are distributed across a widespread network and carry out a variety of tasks. The blocks of data are stored on nodes (compare it to small servers). Nodes can be any kind of device (mostly computers, laptops or even bigger servers). Nodes form the infrastructure of a blockchain. All nodes on a blockchain are connected to each other. This unit of an application is one of the main processing component of the system which runs in background without having any user interface. The whole transaction process is divided into two different blocks. NODE 1 is first block and the responsibility of it is validating the sender bank and the user by decrypting the token encrypted from the requested transaction. Another responsibility is again encrypting the decrypted token to send it securely on network to next processing unit NODE 2. If this unit fails the system will not work.

3.5.4 Processing NODE 2

The nodes (blocks) are connected to each other forming a chain of blocks. The NODE 2 is the second processing unit of entire banking system which runs in background. Transaction packet encrypted by NODE 1 is received by NODE 2. Now NODE 2 decrypt this package then NODE 2 validates the receiver's bank, receiver's name also because money should not get sent to other user by mistakenly and Indian Financial System Code (ISFC). After that updating the receiver's bank database and giving the acknowledgement for the same to sending bank user. Nodes follows consensus algorithm.

3.6 Gantt Chart

A number of activities need to be scheduled and followed to complete the project smoothly. The gantt chart at a glance provides information regarding the activities and their schedule visually. The first being topic selection and requirements gathering took more time than expected. In the next few months analysis of the requirements of the proposed system along with literature survey. Then the presentation of selected topic was given to faculties. Then comes designing of flow chart to understand flow of data and application. Creation of dataset took place after it. Now real coding start which user interface(UI) design took place followed by that coding of actual modules started. Coding took approx 41 days to complete. Then all coded modules were integrated and went under software testing. After a brief break period a paper was published propagating the system.. Now after successful testing project is deployed. Final working prototype was ready by the end of March. Figure 3.2 represents gantt chart for this proposed system.

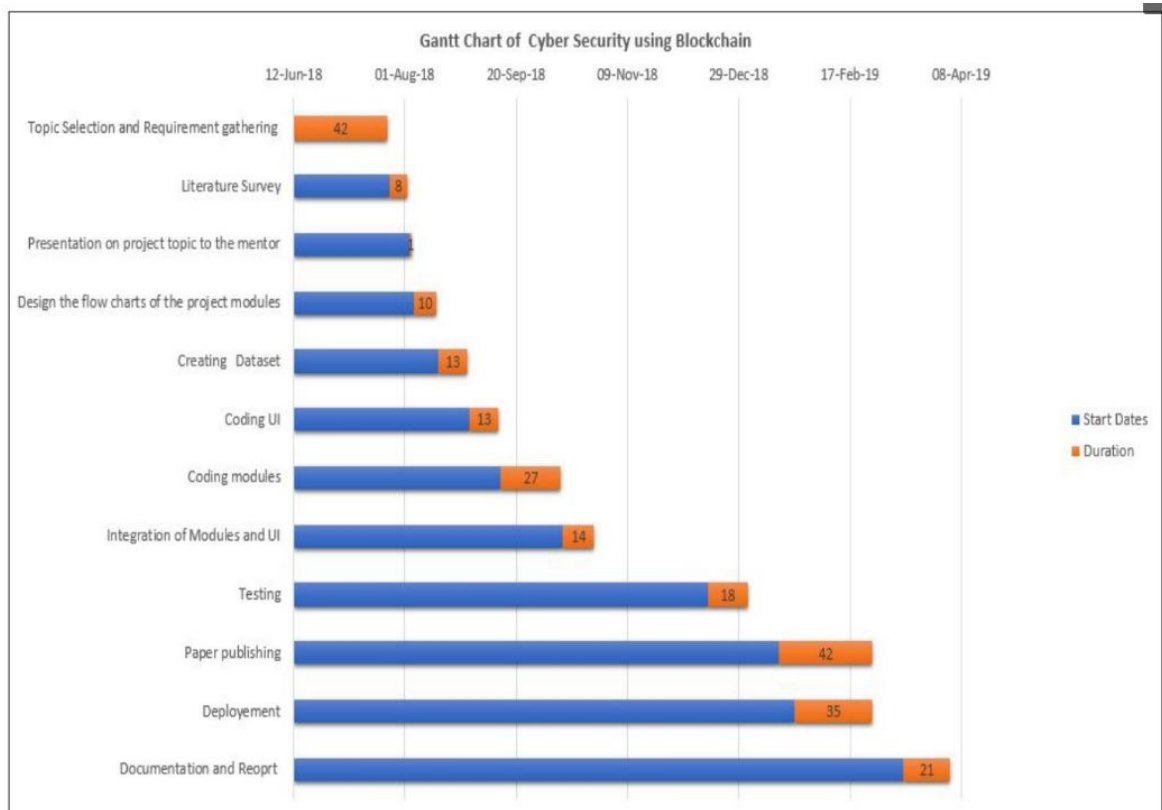


Fig. 2: Gantt Chart

3.7 Data Model and Description

Data Model describes the relationship and association among data which includes Entity Relationship Model. The ER or (Entity Relational Model) is a high-level conceptual data model diagram. Entity-Relation model is based on the notion of real-world entities and the relationship between them. ER diagrams also are often used in conjunction with data flow

diagrams (DFDs), which map out the flow of information for processes or systems.

3.7.1 Entity Relationship Model

Figure 3.3 shows the Entity Relationship Diagram of the proposed system. An Entity Relationship diagram is a data modeling technique that graphically illustrates an information system's entities and the relationships between those entities. Entities, which are represented by rectangles. An entity is an object about which you want to store information. Actions, which are represented by diamond shapes, show how two entities share information in the database. A key attribute is the unique, distinguishing characteristic of the entity. ER Diagrams are most often used to design or debug relational databases in the fields of software engineering, business information systems, education and research. Also known as ERDs or ER Models, they use a defined set of symbols such as rectangles, diamonds, ovals and connecting lines to depict the interconnections of entities, relationships and their attributes. Here, the entities are:- User, Login, Roles, Transaction, Beneficiary, Admin, Otp generation. First admin is major entity as the admin controls banking activities. Admin logins using the credentials which are already assigned to admin. These credentials has predefined roles and according to these assigned roles it's determined that visitor is admin or user. These roles have attributes such as id,role description,type ie. user or admin. Admin also have attributes such as name,id,contact.Now User logins using his credentials roles are assigned to them. So, user has roles. User has various attributes such as name,account number, id, contact. Now user manages beneficiary ie. add/remove and activate beneficiary. Beneficiary has various attributes such as name,his branch ISFC code,account number. Now user has relationship with transaction of performing it so user perform transaction. Transaction has various attributes such as type of transaction ie. credit or debit, amount, date. Transaction requires the one time password(OTP).

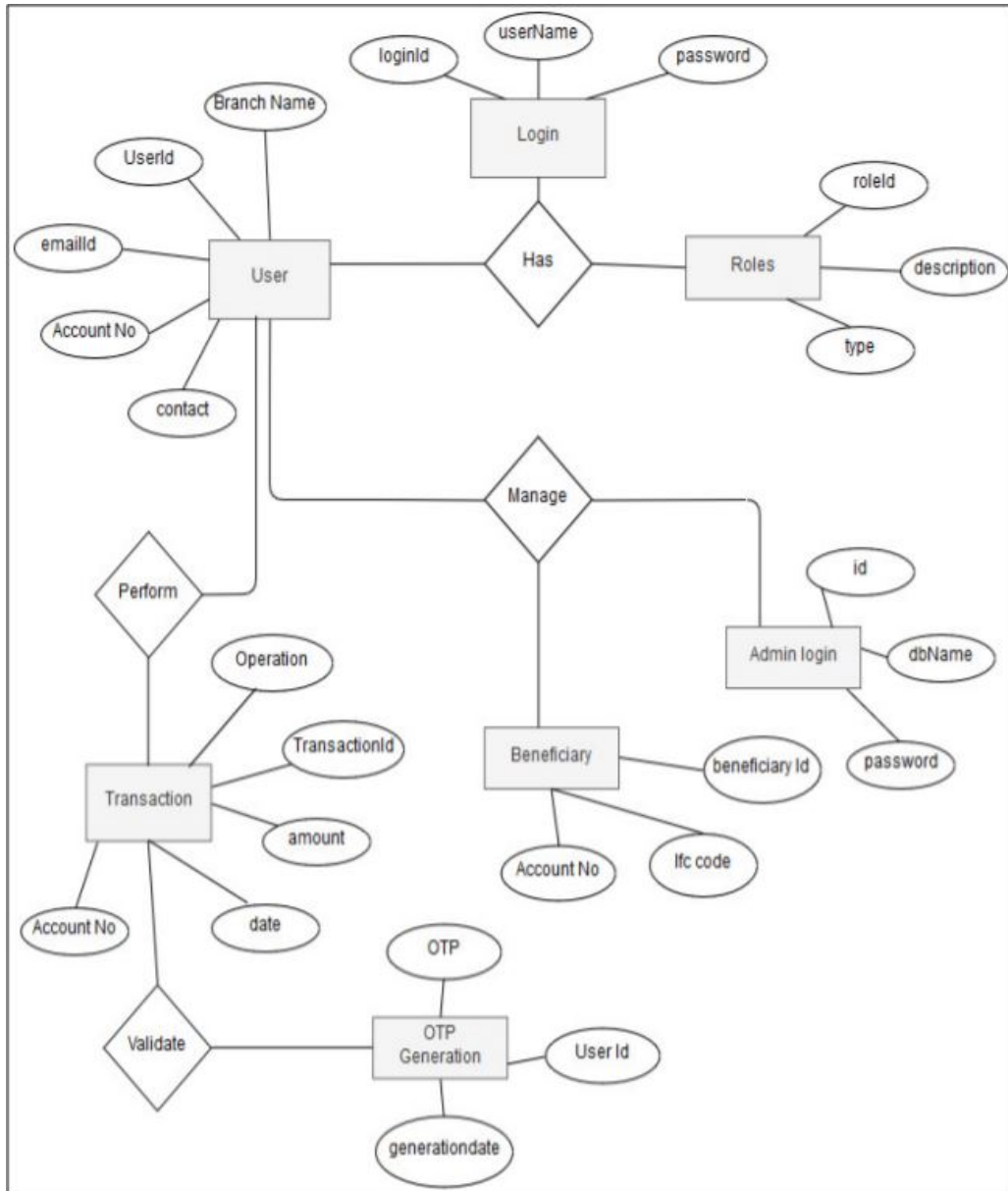


Fig. 3: Entity Relationship Model

3.8 Fundamental Model

Fundamental model of the project gives overall idea about the project. How the entities are related to each other, what are the attributes of the entities, how the data flows between the entities is shown by the fundamental model.

3.8.1 Data Flow Model

A Data Flow Diagram (DFD) is a graphical representation of the flow of data through an information system, modelling its process aspects. A DFD is often used as a preliminary step to create an overview of the system, which can later be elaborated. DFDs can also be

used for the visualization of data processing (structured design). A DFD shows what kind of information will be input to and output from the system, where the data will come from and go to, and where the data will be stored. It does not show information about the timing of process or information about whether processes will operate in sequence or in parallel. It includes data inputs and outputs, data stores, and the various sub processes the data moves through. DFDs are built using standardized symbols and notation to describe various entities and their relationships

DFD LEVEL 0

Figure 3.4 denotes the Level 0 Data Flow Diagram of the proposed system. It is also known as the context diagram. The process name in the context diagram should be the name of the information system. For example, Grading System, Order Processing System, Registration System. This is primarily used to explain the process to business people. It shows a data system as a whole and emphasizes the way it interacts with external entities. It is a complex representation of entire system shows entire overview. It displays the most abstract form of a system. It gives a quick idea about the data flow inside the system. There is only one visible process that represents the functions of a complete system. The system for simplification is divided by two entities that make up the level 0 DFD which are user and admin both access the web application and according to credentials they get directed to their page where user can perform transaction, and perform other common banking activities and admin can view and approve the user requests and controls the branches. This is the most basic representation of the system

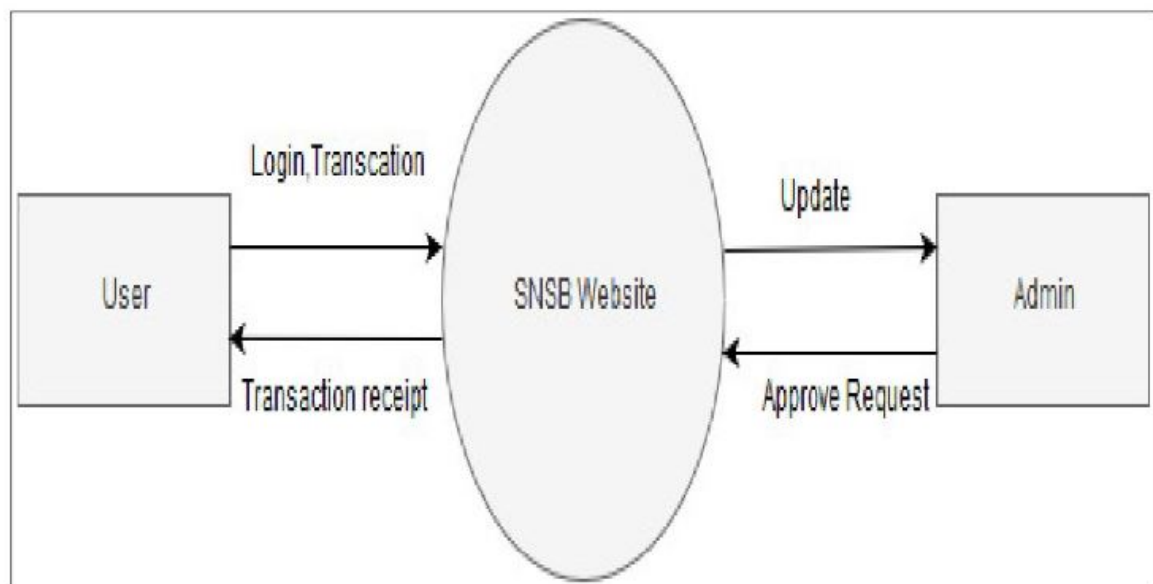


Fig. 4: DFD Level 0

DFD LEVEL 1

Figure 3.5 shows the Level 1 Data Flow Diagram of the proposed system. It is exactly the same as the Level 0 DFD, but much simplified. The Level 1 DFD shows how the system

is divided into sub-systems, each of which deals with the one or more of the data flows to or from an external agent, and which together provide all of the functionality of the system as a whole. It breaks down the main processes into sub-processes that can then be analyzed and improved on a more intimate level. The figure 4.4 Data flow diagram for level 1 gives the overall working of the system including all the entities, processes and the databases. In above figure represents BANK 1 authentication of the user to verify the account where user put username and password is going to validate using the existing database. If user validate then access the bank account and also money can be transfer to other account. After verify the account BANK 1 user want to transfer money to BANK 2 user. BANK 1 user request money transfer to NODE 1 in form of token, NODE 1 can decrypt token and validate token with bank after validation token will be again encrypted and send to NODE 2. NODE 2 can received token from NODE 1 and decrypt it and check for validate bank then BANK 2 received money. After this database will be updated and also balance updated in receiver's account and money is deducted from BANK 1 user account then the transaction will be successful.

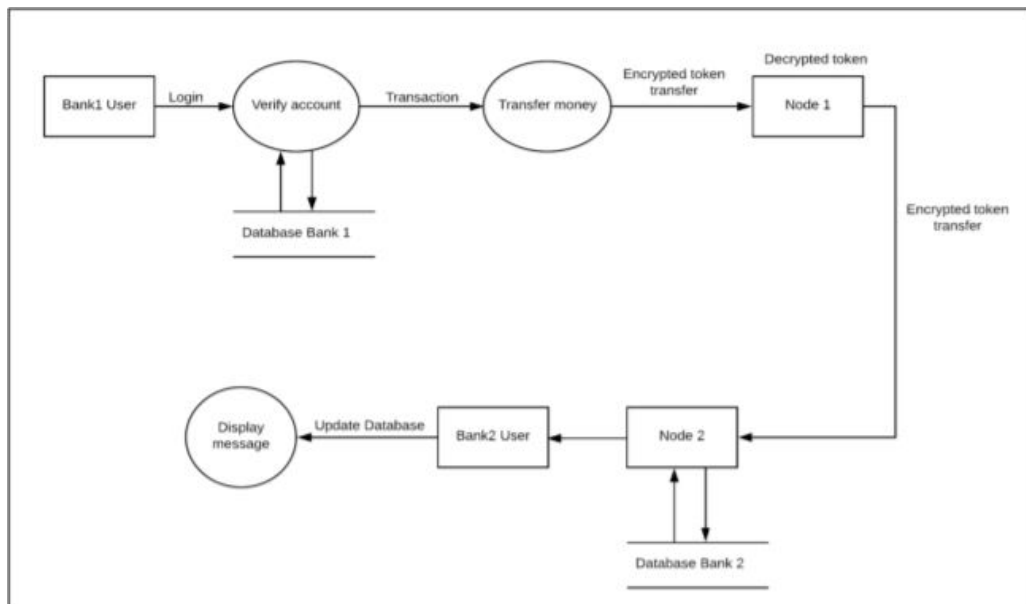


Fig. 5: DFD Level 1

3.9 Use Case Diagram

Figure 3.6 denotes the Use Case Diagram of the proposed system. It shows the user's interaction with the systems. The purpose of a use case diagram in Unified Modeling Language (UML) is to demonstrate the different ways that a user might interact with a system. Use case diagrams are valuable for visualizing the functional requirements of a system that will translate into design choices and development priorities. They also help identify any internal or external factors that may influence the system and should be taken into consideration. In first use case diagram there are two main components one is actor which is user and and database. It depicts the interactions between the various actors used in this system. All these interactions between actors and system is done in the cloud environment. There are various

usecases involved in this system such as register,add beneficiary,activate beneficiary,view my statements,generate one time password etc. The other use case diagram has only one actor which is admin. Admin also has various use cases such as add branch,view all user requests and approve them.

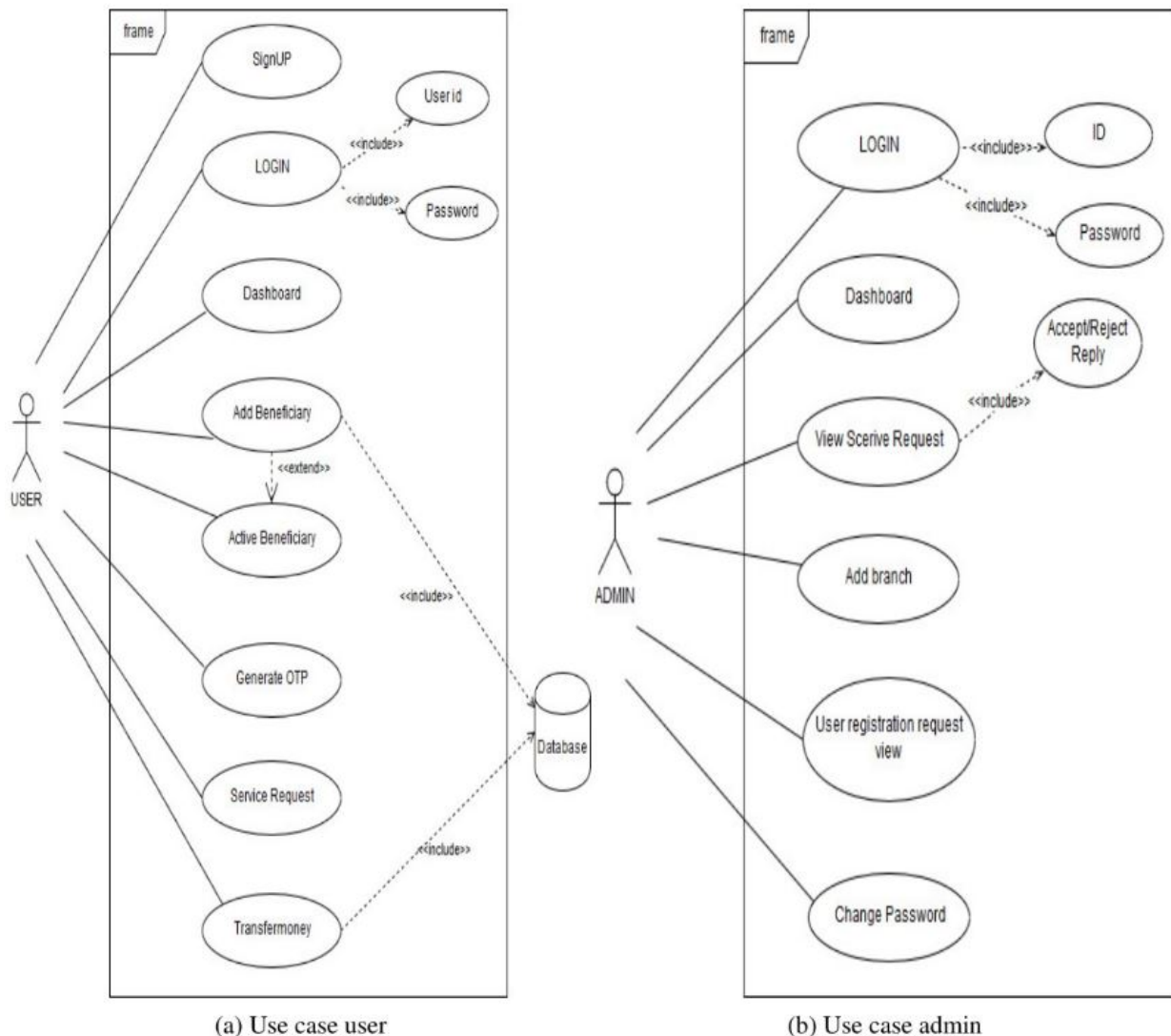


Fig. 6: Use Case Diagram

3.10 Activity Diagram

Activity diagram is a flowchart to represent the flow from one activity to another activity. The basic purposes of activity diagrams is similar to other four diagrams. Activity diagrams are not exactly flowcharts as they have some additional capabilities. It captures the dynamic behavior of the system. The activity can be described as an operation of the system. The control flow is drawn from one operation to another. It captures the dynamic behavior of the system. Activity diagrams are used for visualizing the system. Figure 3.7 denotes the activity diagram of the proposed system. The following is just the flow in a single cycle this whole

flow is repeated continuously from start to end. First person enter credentials then according to role assigned to it redirect to user or admin page. User performs various banking activity and admin also does the same part.

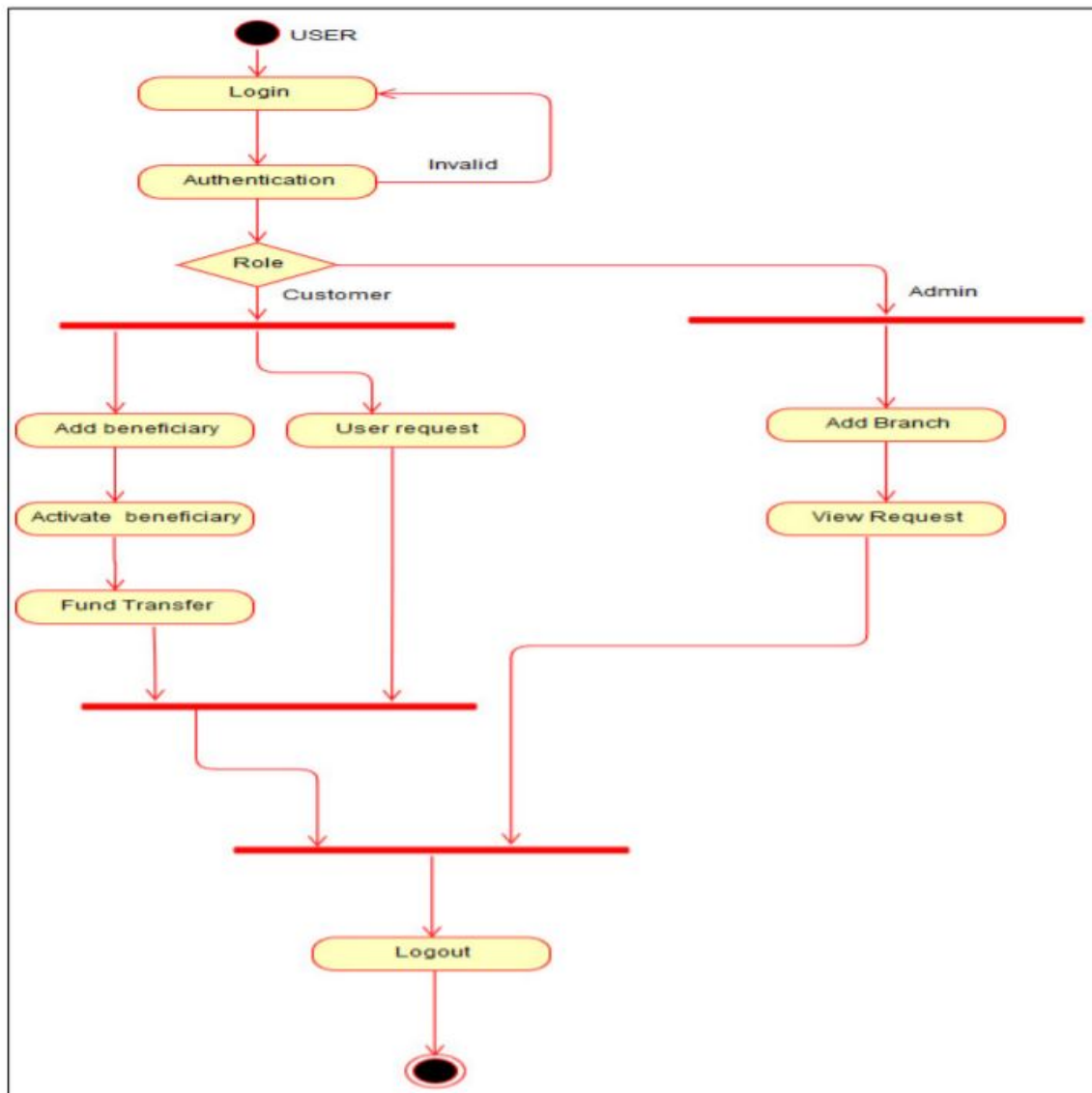


Fig. 7: Activity Diagram

3.11 Sequence Diagram

Figure 3.8 represents the sequence diagram of the Banking transaction in the system. The BANK 1 user send request to admin for create new user. Admin will decide whether accept or not. When admin accept the request, new user created otherwise account cannot be created. After creating new user account BANK 1 user want to transfer money to BANK 2 user. BANK 1 user request money transfer to NODE 1 in form of token, NODE 1 can decrypt token and validate token with bank after validation token will be again encrypted and send to NODE 2. NODE 2 can received token from NODE 1 and decrypt it and validate

bank then BANK 2 received money transaction.

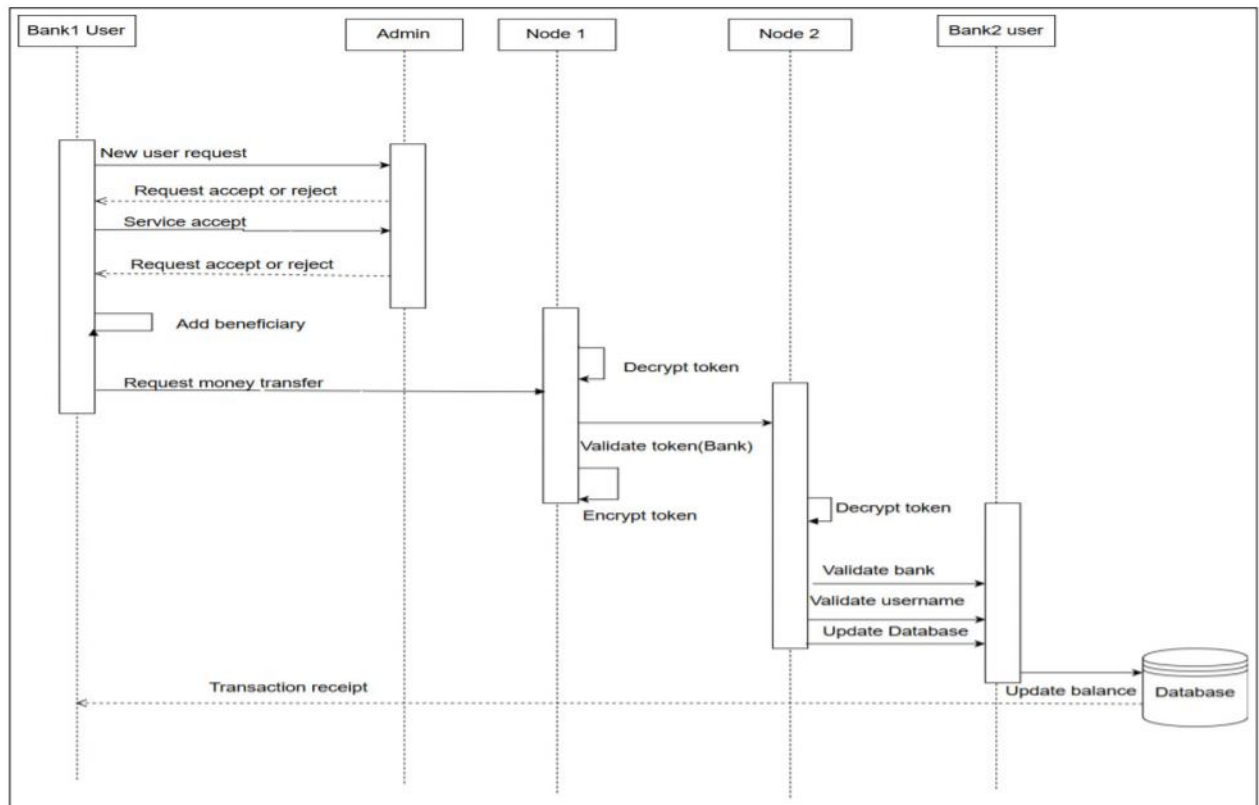


Fig. 8: Sequence Diagram

3.12 Test Cases

A test case is a set of conditions or variables under which a tester will determine whether a system under test satisfies requirements or works correctly. Table 3.3 shows the test case of proposed system. First 1 to 9 test case are for user specifying login and registration, and various banking activities. Test case 10 to 14 are of admin where admin can login, add branch and view service. From 15 to 17 are of system for authentication and validation purpose such as connectivity of node, money transfer and failure of nodes.

Test case Id	Test Case Description	Pre-requisite	User Roles	Test Data	Expected Output	Actual Output	Test Status
1	Navigation Graphical UI	Click on the links	User	URL:http://localhost:8080/snsb/home.html	Appropriate page should be opened	Appropriate page displayed	Pass
2	Login, Password	Appropriate data should be entered	User	URL:http://localhost:8080/snsb/login.html	Login should be successful for Authorized user	Login successful for Authorized user	Pass
3	User registration form	Appropriate data should be entered	User	URL:http://localhost:8080/snsb/userregistration.html	User Account should be created	User Account Created	Pass
4	Adding Beneficiary	Details of beneficiary Account	User	URL:http://localhost:8080/snsb/addbeneficiary.html	Name added for activated list	Activated list updated	Pass
5	Active Beneficiary	Activation code to be submitted	User	URL:http://localhost:8080/snsb/confirmbeneficiary.html	Confirm Activation	Confirm Activation Page Opened	Pass
6	Generate OTP	User ID and Transaction ID	User	URL:http://localhost:8080/snsb/otpgeneration.html	Otp send to Register Mail	Success to send OTP	Pass
7	Transfer Money	Amount to be transferred and OTP	User	URL:http://localhost:8080/snsb/moneytransfer.html	Money should get Deducted	Transaction successful	Pass
8	Statement View	Link page opened	User	URL:http://localhost:8080/snsb/viewmytransactions.html	Transaction Details should be displayed	Updated Transaction	Pass
9	Request for services	Selecting the request from the drop down	User	URL:http://localhost:8080/snsb/servicerequest.html	Request must be transferred to the admin	Request has been sent and will be severed soon	Pass

Test case Id	Test Case Description	Pre-requisite	User Roles	Test Data	Expected Output	Actual Output	Test Status
10	Login, Password	User enters invalid input details	User	URL:http://localhost:8080/snsb/login.html	Login should be unsuccessful along with error message	User is navigated by showing error message about login details	Pass
11	Login, Password	valid data should be entered	Admin	URL:http://localhost:8080/snsb/login.html	It should be diverted to the website page	Home Page is displayed	Pass
12	Service Request list	Approved button	Admin	URL:http://localhost:8080/snsb/viewallservice request.html	It should Accept the service	Service Accepted	Pass
13	User Request list	Approved button	Admin	URL:http://localhost:8080/snsb/viewregistration requests.html	It should Reject the service	Service Rejected	Pass
14	Adding New Branch	Valid details of the bank	Admin	URL:http://localhost:8080/snsb/addbranch.html	Branch Added Successfully	New Branch Created	Pass
15	Connectivity Of Nodes	Ping IP address	System	URL:http://localhost:8080/node1/veryfytransfer A.html	All 4 packet should transfer	Packets Getting transferred	Pass
16	Money Transfer through Nodes on Console	Amount To be transferred in BANK 1	System	URL:http://localhost:8080/snsb/confirmmoney transfer.html	Successful On all console and receivers balance should update	All nodes successfully transact and updates the Balance	Pass
17	Failure of any Node	Disconnect one NODE	System	URL:http://localhost:8080/snsb/transfer.html	Should Not transact the amount	Failure in transaction	Pass

Table 3: Test Cases

Chapter 4

RESULTS

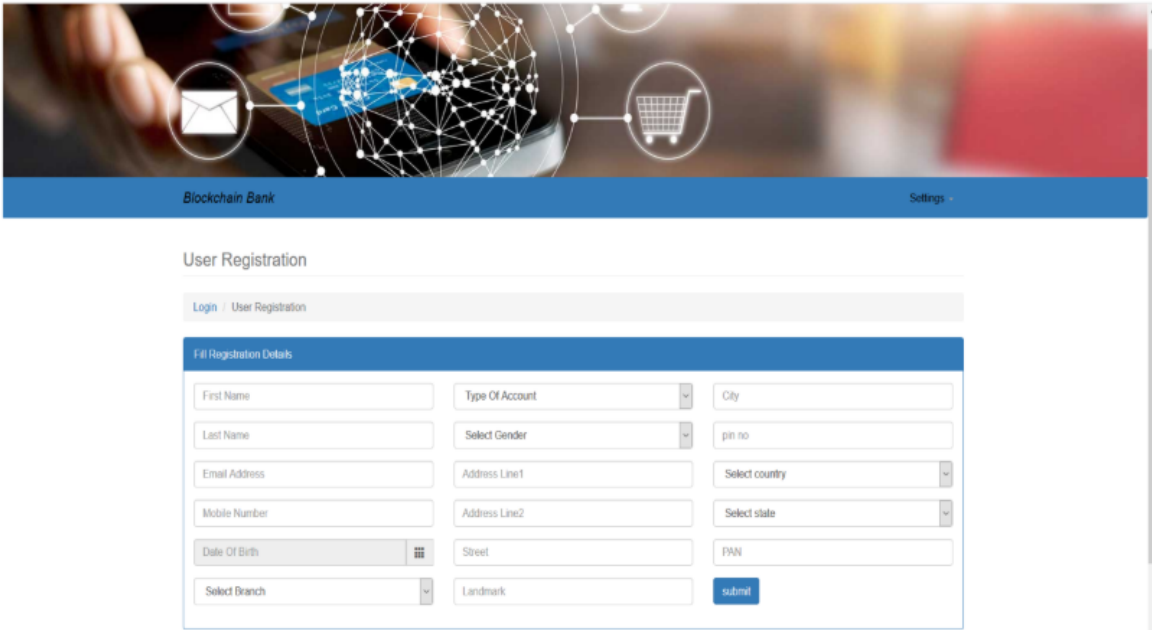
This chapter includes the snapshots of Cyber Security with Blockchain's outputs that were seen by the user and this chapter also contains the results of the proposed system. Results tells about outcomes/findings of the research study. What does the result or data from the experiment mean to us is described in discussion.

4.1 Snapshots of Project

This section provides the snapshots of the proposed system and the outputs that are displayed to the user. Images are the best way to grab anyone's attention and make the understanding of the system a lot easier. The more number of image more it will be easier to understand the system.

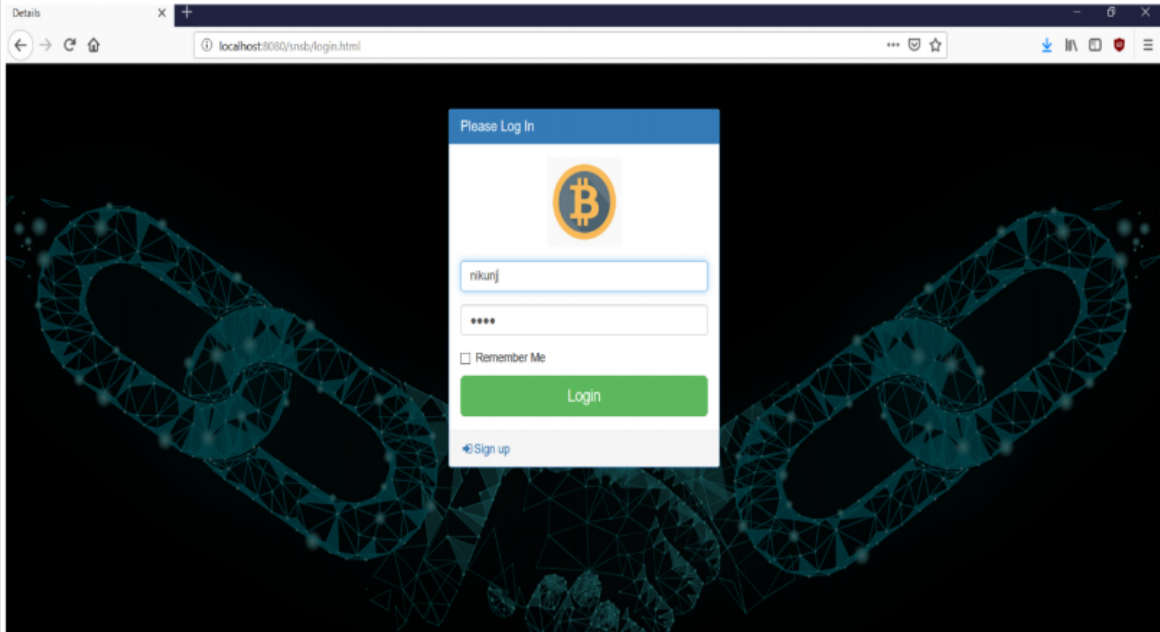
Login Page Deciding Role of Person

The System mainly consists of the two modules User end and the Admin end. To use the web application the user has to first sign up. User can sign up by creating the account with the details such as Name, Address, Mobile No, Type of Account, Required branch, Permanent Account Number(PAN), Country, State, Type of account required, Date of birth, Gender as shown in Figure 4.1 and these details will be provided by the user to bank. After the successful registration, admin now accept or reject the user registration request. Based on information provided by user admin check if all information is valid or not. Now mail containing user id and password is sent to user. Now user can login using given credentials and use various banking facilities as shown in Figure 4.2.



The image shows a web browser window displaying the 'User Registration' page of 'Blockchain Bank'. The header features a blue bar with the bank's name and a 'Settings' link. Below the header, the page title 'User Registration' is followed by a breadcrumb trail 'Login / User Registration'. The main content area is titled 'Fill Registration Details' and contains a form with the following fields: First Name, Last Name, Email Address, Mobile Number, Date Of Birth (with a calendar icon), Select Branch, Type Of Account (dropdown), Select Gender (dropdown), Address Line1, Address Line2, Street, Landmark, City, pin no, Select country (dropdown), Select state (dropdown), and PAN. A blue 'submit' button is located at the bottom right of the form.

Figure 4.1: Registration Page



The image shows a web browser window displaying the 'Please Log In' page of 'Blockchain Bank'. The browser's address bar shows 'localhost:8080/smb/login.html'. The login form is centered on a dark background with a large, stylized Bitcoin logo. The form includes a Bitcoin icon, a text input field containing 'nikunj', a password input field with four asterisks, a 'Remember Me' checkbox, a green 'Login' button, and a 'Sign up' link with an arrow icon.

Figure 4.2: Login Page

User End Consist Of Following Segments

After creating user with the help of login page user can access the facilities provided by the bank such as User Details, Bank Details as given in the following Figure 4.3.

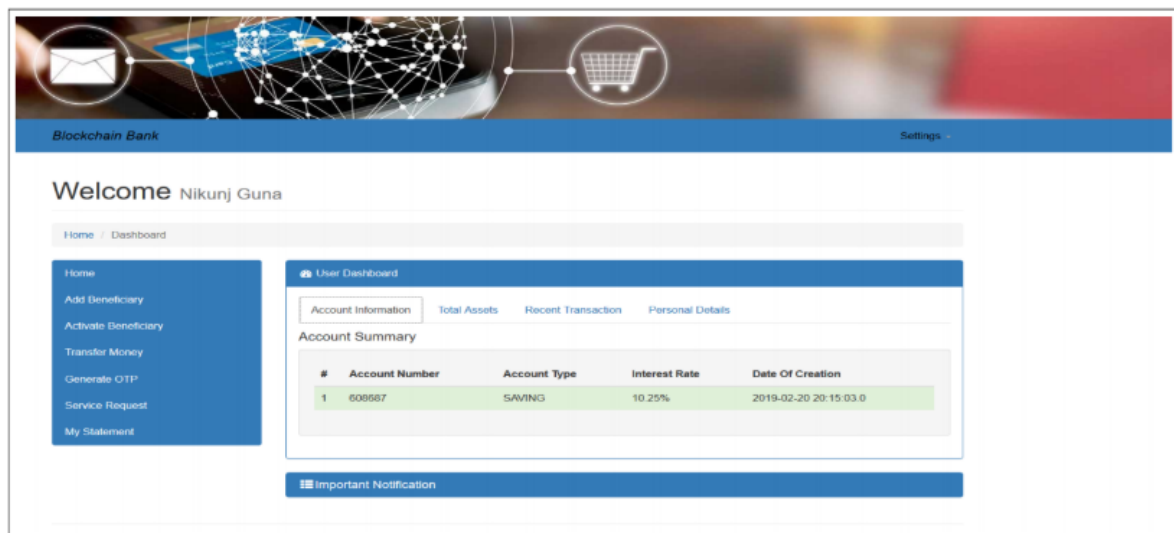


Figure 4.3: User Dashboard

For, viewing the details of account like personal details, previous transactions and total assets the dashboard is provided as shown above.

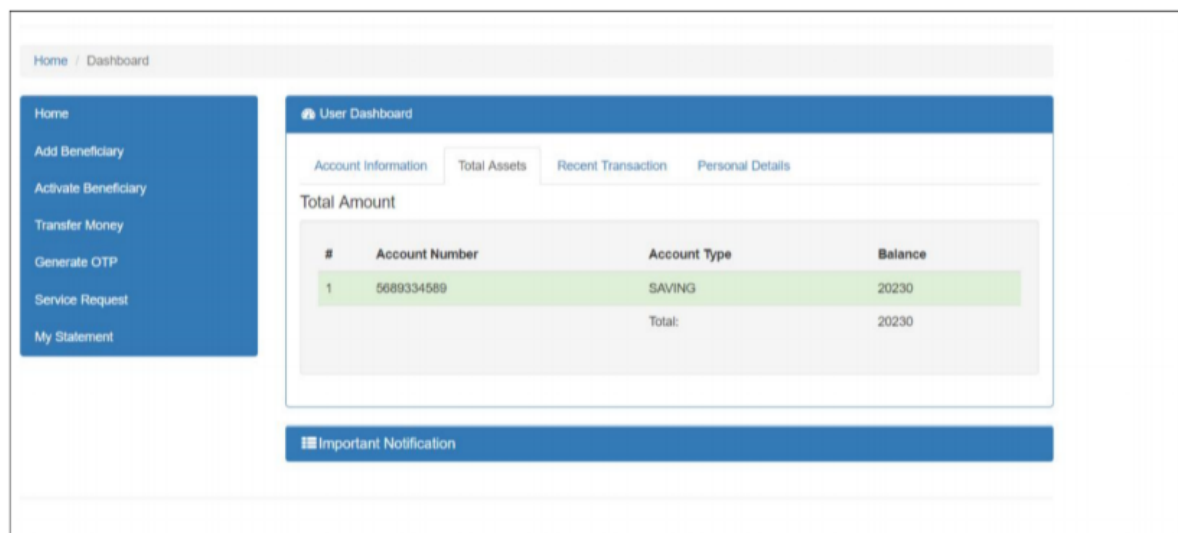


Figure 4.4: Balance Details

The information regarding the balance details of the sender is provided above

The screenshot shows a web application interface for a user dashboard. On the left is a blue sidebar menu with options: Home, Add Beneficiary, Activate Beneficiary, Transfer Money, Generate OTP, Service Request, and My Statement. The main content area has a header 'User Dashboard' and four tabs: Account Information, Total Assets, Recent Transaction, and Personal Details (which is active). Below the tabs, the 'User Details' section displays the following information:

User Name: div	Branch Name: Borivali East
First Name: Divyang	Branch Code: 1
Last Name: Thummar	IFSC Code: SNSB2K0001
Email Id: blockchainucoe@gmail.com	

At the bottom of the main content area, there is a blue bar with the text 'Important Notification'.

Figure 4.5: User Personal Details

In Order to transfer money to another account the sender must add the Beneficiary details as account number IFSC code, and type of Account as shown in Figure 4.6 and request for activation code as in Figure 4.7 in order to activate the Beneficiary Once it gets activated the name will be appeared in the drop-down list as shown in Figure 4.9.

The screenshot shows the 'Add Beneficiary' page of the Blockchain Bank application. The header includes 'Blockchain Bank' and a 'Settings' link. Below the header, it says 'Welcome Nikunj Guna'. The left sidebar menu is the same as in Figure 4.5. The main content area has a header 'Add Beneficiary' and a form with the following fields:

- Full Name:** A text input field containing 'Divyang Thummar'.
- Account Number:** A text input field containing '180925'.
- Account Type:** A dropdown menu with 'TYPE OF ACCOUNT' selected.
- IFSC Code:** A text input field containing 'SNSB2K0001'.
- Add Beneficiary:** A blue button at the bottom of the form.

Figure 4.6: Add Beneficiary

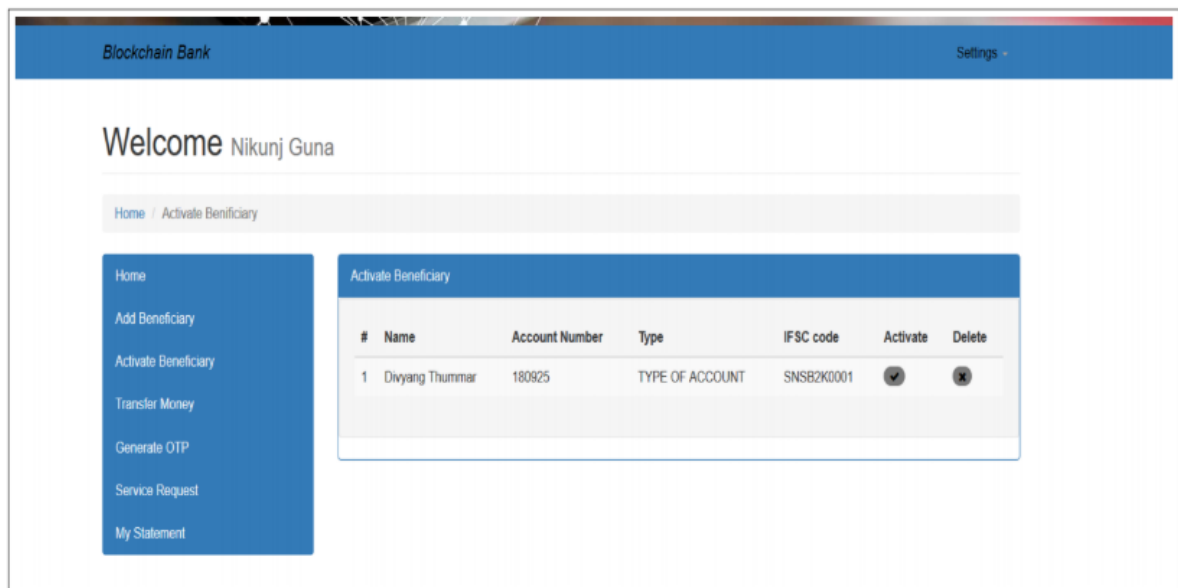


Figure 4.7: Activate Beneficiary

In order to proceed with the transaction user must need to generate the otp by entering the transaction id and Password as in Figure 4.8. The otp will be sent to registered mail id and enter in the otp field as shown in Figure 4.9.

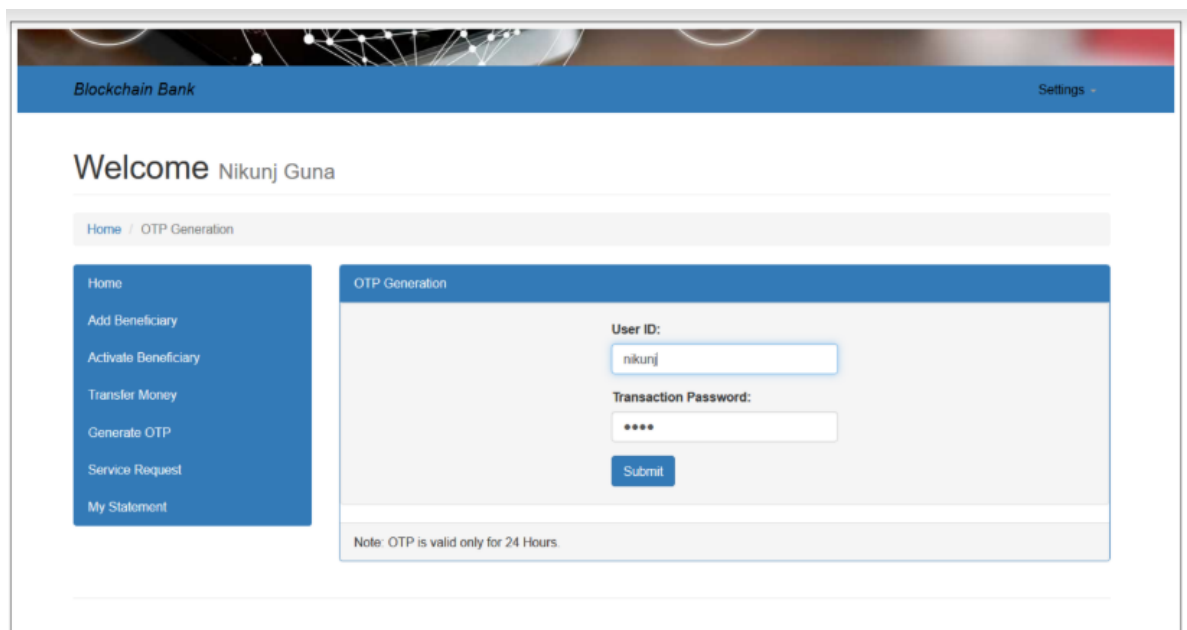


Figure 4.8: OTP Generation

The screenshot shows the 'Blockchain Bank' website. The header includes the bank name and a 'Settings' link. The main content area is titled 'Welcome Nikunj Guna'. Below this, there's a breadcrumb trail 'Home / Money Transfer'. A left sidebar contains a menu with options: Home, Add Beneficiary, Activate Beneficiary, Transfer Money, Generate OTP, Service Request, and My Statement. The main panel, titled 'Money Transfer', contains the following fields and controls:

- Select Account:** A dropdown menu showing '608667'.
- Select Beneficiary:** A dropdown menu showing 'Divyang Thummar'.
- Amount:** A text input field containing '400'.
- Enter OTP:** A text input field containing '626279'.
- Generate OTP:** A small link below the OTP field.
- Transfer:** A blue button at the bottom of the form.

Figure 4.9: Money Transfer

After valid OTP the transaction takes place and message is displayed as in Figure 4.10.

The screenshot shows the 'Blockchain Bank' website with a 'Message' banner. The breadcrumb trail is 'Home / Message'. The message content area displays: 'Money Transaction Proceed Successfully'.

Figure 4.10: Successful Transfer

Figure 4.11 shows transfer failure if OTP entered by the user is invalid.

The screenshot shows the 'Blockchain Bank' website with a 'Message' banner. The breadcrumb trail is 'Home / Message'. The message content area displays: 'Transaction Declined. Invalid OTP'. At the bottom of the page, there is a copyright notice: 'Copyright © Block Chain Project 2019'.

Figure 4.11: Transfer Failed

Figure 4.12 shows receipt of a successful money transfer.

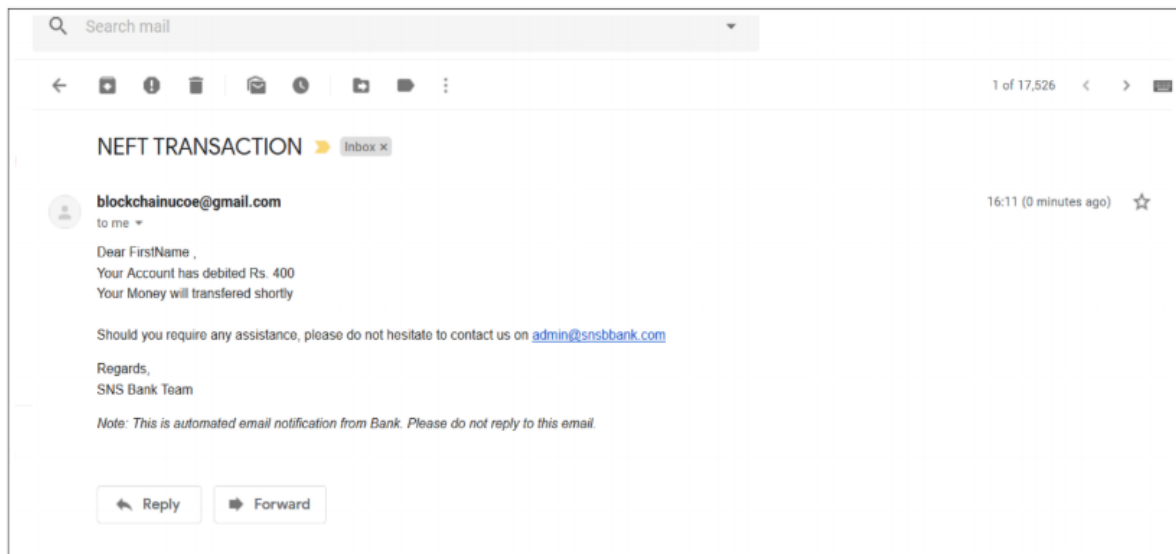


Figure 4.12: Transfer Receipt

Admin End Consist Of Following Segments

At the Admin page after successfully login dashboard will appear with number of request remaining in Figure 4.13.

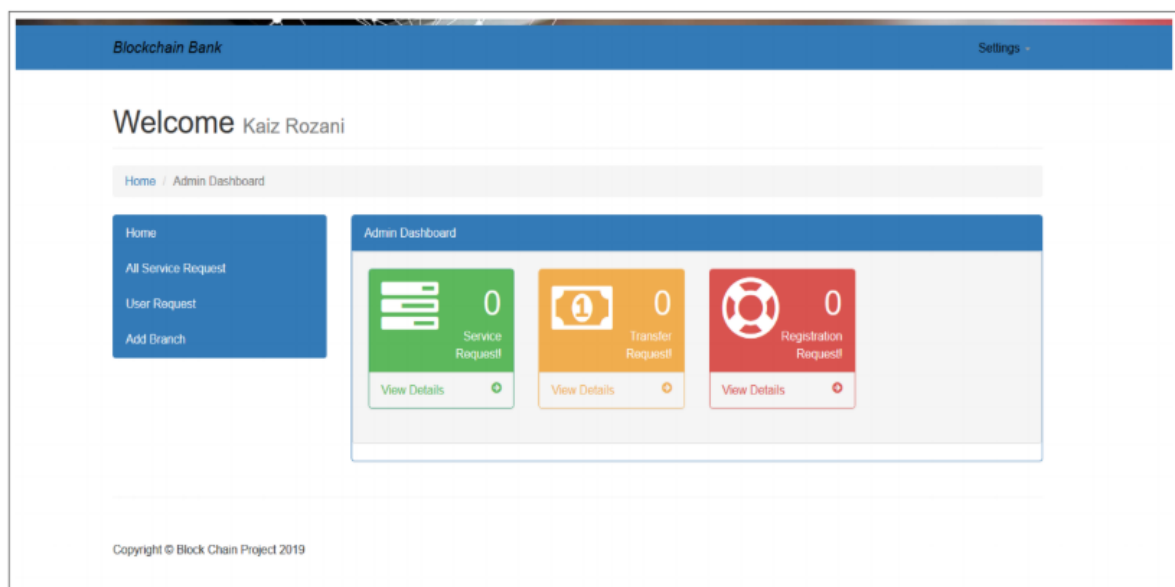
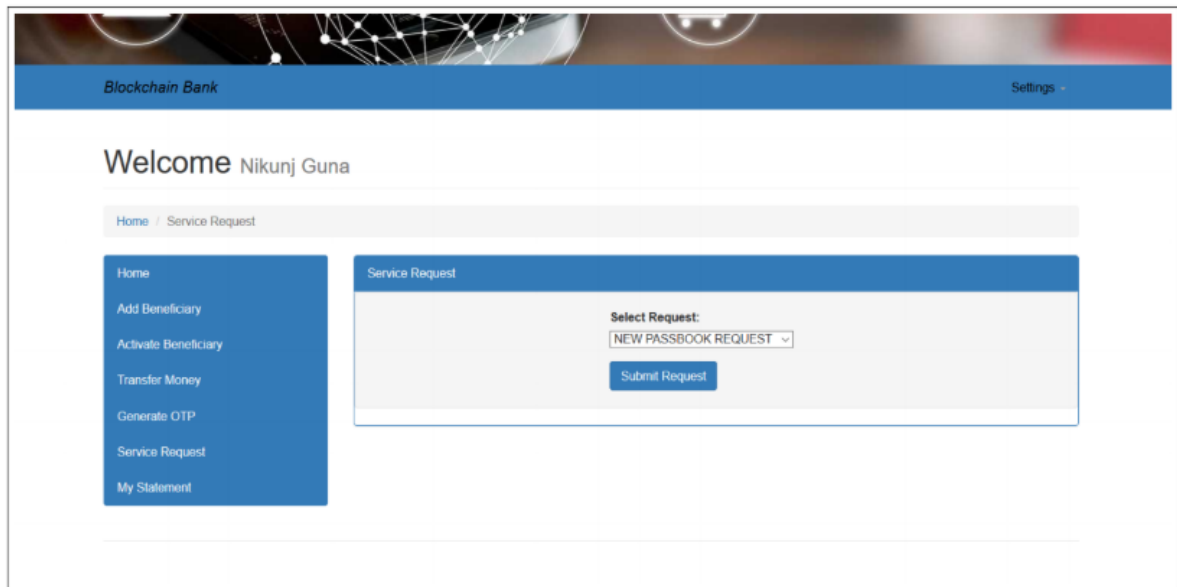


Figure 4.13: Admin Dashboard

Admin can accept or reject service request forwarded by the user as shown in Fig 4.14.



The screenshot shows the Blockchain Bank Admin Dashboard. The header includes the bank name and a settings menu. The main content area is titled 'Welcome Nikunj Guna' and shows a breadcrumb trail 'Home / Service Request'. A sidebar menu on the left lists various admin functions. The main panel, titled 'Service Request', contains a dropdown menu for 'Select Request' with 'NEW PASSBOOK REQUEST' selected, and a 'Submit Request' button.

Blockchain Bank

Settings

Welcome Nikunj Guna

Home / Service Request

Home

Add Beneficiary

Activate Beneficiary

Transfer Money

Generate OTP

Service Request

My Statement

Service Request

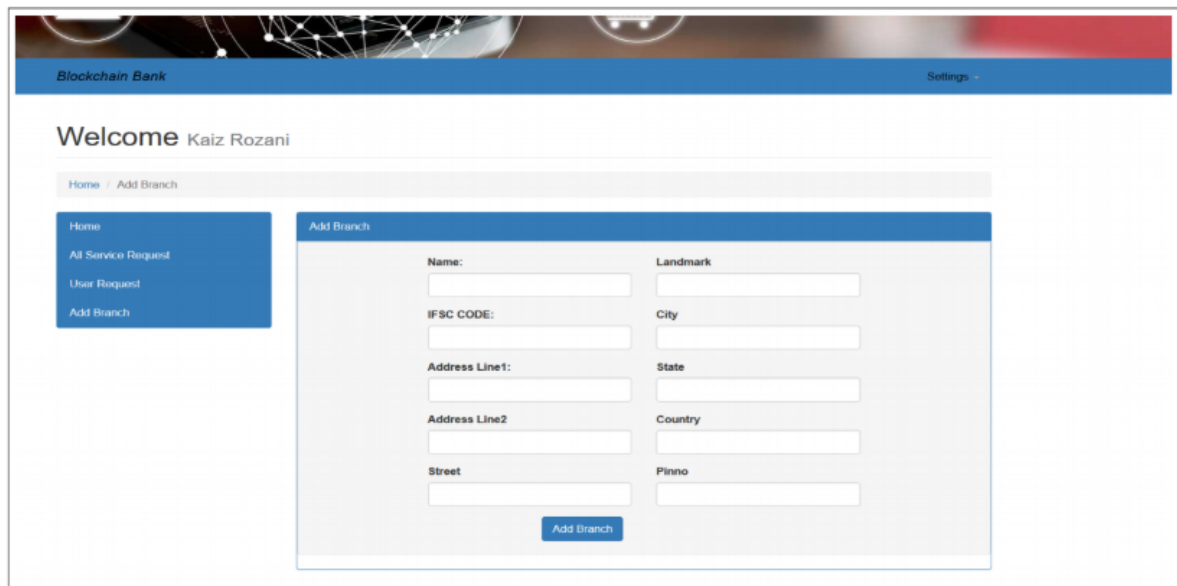
Select Request:

NEW PASSBOOK REQUEST

Submit Request

Figure 4.14: Service Request

The admin can also add a new branch to the bank as shown below.



The screenshot shows the Blockchain Bank Admin Dashboard. The header includes the bank name and a settings menu. The main content area is titled 'Welcome Kaiz Rozani' and shows a breadcrumb trail 'Home / Add Branch'. A sidebar menu on the left lists various admin functions. The main panel, titled 'Add Branch', contains a form with fields for Name, Landmark, IFSC CODE, City, Address Line1, State, Address Line2, Country, Street, and Pinno, and an 'Add Branch' button.

Blockchain Bank

Settings

Welcome Kaiz Rozani

Home / Add Branch

Home

All Service Request

User Request

Add Branch

Add Branch

Name:

Landmark

IFSC CODE:

City

Address Line1:

State

Address Line2:

Country

Street

Pinno

Add Branch

Figure 4.15: Add Branch

This is used to add the branch of bank to which the amount is supposed to be transferred by the sender.

4.2 Result In Graph

This section provides a graphical representation of efficiency considering the time required for transaction for regular NEFT and blockchain NEFT along with the time complexity of traditional and proposed system as shown in Figure 4.16.

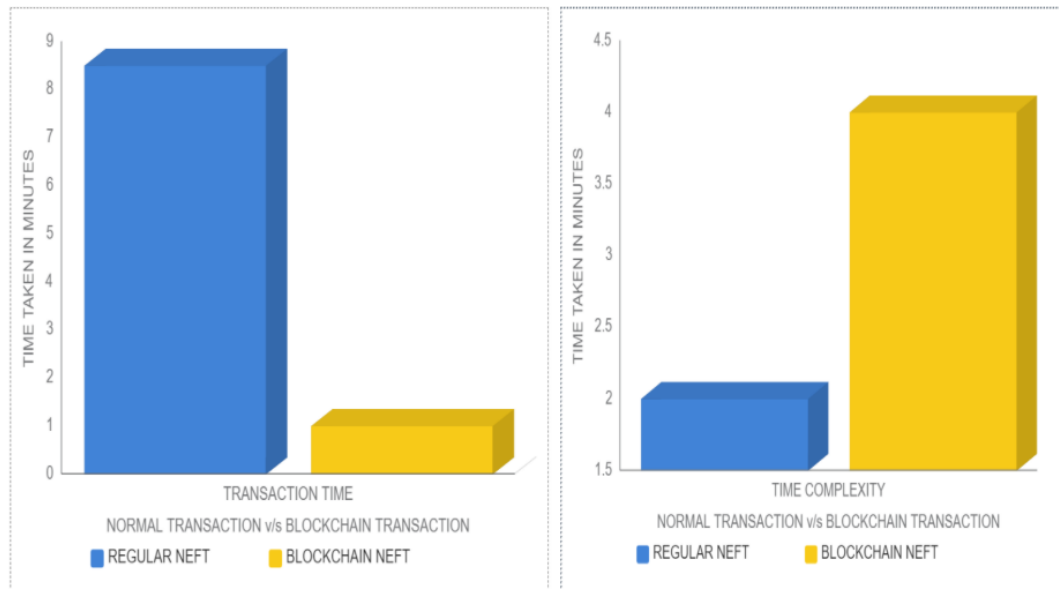


Fig 4.16 Efficiency comparison in Graph

Figure 4.17 shows of reduction of cost if blockchain technology will be implemented in banking sector.

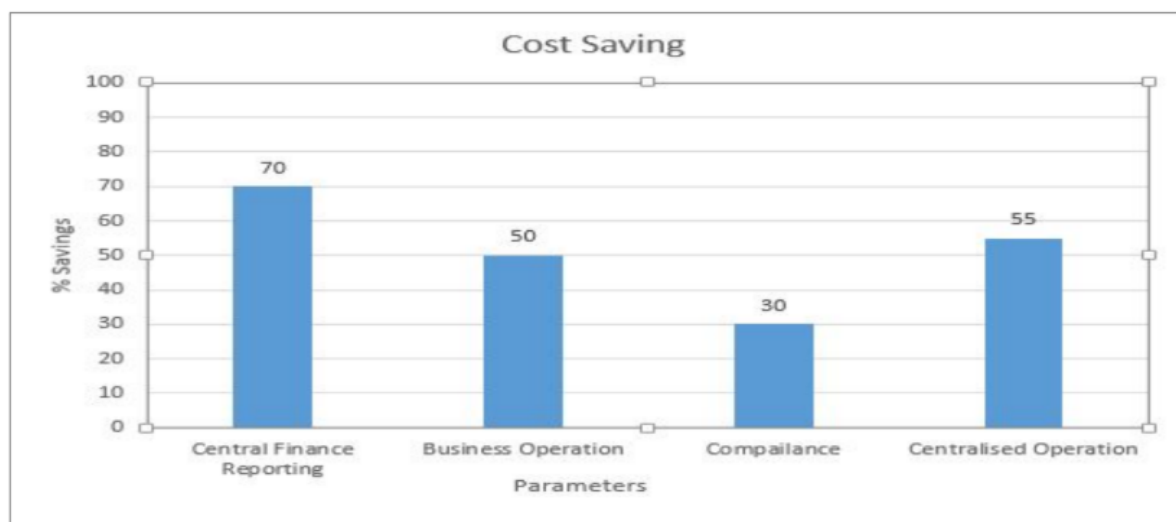
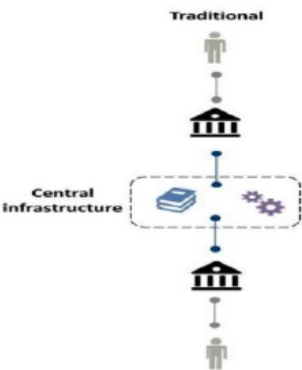
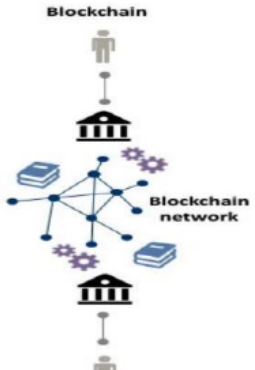


Figure 4.17: Cost Reduction Graph

4.3 Comparison with existing system

This section provides final result and tells what exactly proposed system offers as compared to traditional system and also traditional what changes it brings.

Table 4.1: Comparison of Existing And Final Proposed System

PARAMETERS	EXISTING SYSTEM	PROPOSED SYSTEM
Messaging	Through central infrastructure	Peer to peer
Cost	Expensive than the proposed system	Fraction of cost
Processing	Centrally	Distributed in blocks
Efficiency	Low efficiency	High efficiency
Safety	Can be tempered and Poor safety	Cannot be tempered Good safety
Infrastructure	 <p>Traditional</p> <p>Central infrastructure</p>	 <p>Blockchain</p> <p>Blockchain network</p>

Chapter 5

Conclusions and Future Scope

Several traditional financial services firms have now initiated strategic partnerships and investments in the space. A variety of Blockchain systems have emerged, though it is still too early in the innovation and development cycle to determine which of these systems, if any, will become sustainable, scalable and successful in the future. Probably, an enormous amount of cooperation between key player including banks, technology firms, stock exchanges, regulators, developers, programmers, and entrepreneurs, will be required for a Blockchain driven financial ecosystem to emerge. This can, however, assume continued experimentation by technology companies, financial services firms, and other key players in the space going forward as they work to make an effective, secure, and viable real-world Blockchain ecosystem a reality. Thus this system is to develop a system of improved facilities and provide great level of security by using the Blockchain technology. Using this system it will overcome the limitations of the existing system ensuring that this system will provide proper security and will reduce the manual work and transaction time.

As banks need to make numerous transactions every day, Blockchain technology could be of enormous significance by bringing in security and genuineness in transactions using our approach. Currently, our system is for small scale environment we can extend the number of nodes in the future to provide higher level of security on large scale. Endorsing an idea of trust economy, Blockchain can give financial institutions an opportunity to win the faith and confidence of their customers. Not to ignore are the potential savings that it could bring in terms of cost and labour for the banking sector.

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Appendices

1) StarUML

StarUML is an open source UML modeling application. StarUML supports most of the diagrams like use case diagrams, activity diagrams, sequence diagrams, class diagrams, etc. It is rich in feature set and formatting options. The diagrams can be exported in jpg, jpeg and png formats. It provides various advancements than other modeling applications.

2) Draw.io

Draw.io is an open source technology stack for building diagramming applications, and the world's most widely used browser-based end-user diagramming application.

3) Eclipse

Eclipse is a platform that has been designed from the ground up for building integrated web and application development tooling. Eclipse provides a common user interface (UI) model for working with tools. It is designed to run on multiple operating systems while providing robust integration with each underlying OS. Plug-ins can program to the Eclipse portable APIs and run unchanged on any of the supported operating systems. At the core of Eclipse is an architecture for dynamic discovery, loading, and running of plug-ins.

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Student Name1: Varsha Naik
Student ID1: 16104054

Student Name2: Riya Pejawar
Student ID2: 16104040

Student Name3: Rishabh Singh
Student ID3: 14104017

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