

Design and Development of E-Meter Reading Web Services for Android Application

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Abstract— As we all know that traditional Electricity billing system is very time consuming and costly. The whole process takes near about 10 to 12 days to generate the electricity bill and works in 5 to 6 steps. So to minimize the cost and complexity involved in processing traditional Electricity billing system, E-Meter billing systems have been proposed as mechanisms to help curb the rising costs of Electricity billing process and also helps to detect the fraudulent issues with electricity providers services. E-Meter app uses open source cloud technologies and android as a platform it helps to reduce the cost and complexity involved in processing traditional Electricity billing system. Traditional process having lot of heavy work and required more time. To recover this drawback E-Meter application is developed which reduce the electricity meter process in just 3 steps & within few seconds. E-Meter reading system is fast and easy way for electricity billing process.

Keywords - E-Meter

I. INTRODUCTION

In today's civilized society, the people are betrayed with proper facilities. In order to minimize the cost and complexity involved in processing traditional Electricity billing system, E-Meter billing systems have been proposed as mechanisms to help curb the rising costs of Electricity billing process and also helps to detect the fraudulent issues with electricity providers services'. The proposed work helps to curb the rising cost of Electricity to certain limit using open source cloud technologies & Android [1]. Our E-Meter system provides solutions to certain top issues in Electricity service provider sector. The E-Meter Application is developed for all the electricity consumer over the area under MSEB (Maharashtra state electricity Board). As per our market survey we analyze that we have to develop this project over Android platform that scope of project will be open for all android users. Security of IT systems to prevent Electricity data being stolen or intentionally corrupted & accuracy of data to prevent incorrect information to be entered [5].

We are going to develop an android application to reduce the traditional Electricity meter reading process, traditional process having lot of heavy work & required more time. To recover this drawback we developing application which reduce the electricity meter process in just 3 steps & within few seconds [4].

Traditional way of electricity bill process is so long, time consuming & required more efforts & cost. Firstly employee takes photo of electricity meter for each customer & makes entry to exchange office & upload photos. After that MSEB server process that data & generate bill, send it to exchange office from exchange office bill forwarded to individual customer door to door. This process evolves more than 3 employees to process each bill & require 10 to 15 day. In order to minimize the cost and complexity involved in processing traditional Electricity billing system, E-Meter billing systems have been proposed as mechanisms to help curb the rising costs of Electricity billing process and also helps to detect the fraudulent issues with electricity providers services.

The computerized high tension (HT) billing system of Maharashtra State Electricity Board (MSEB) was initially implemented in 1981 and re-engineered during 1997-2000. The computerized HT billing system was initially implemented in 1981 in COBOL on Unix platform and after considering the sensitivity of the application and ever increasing need for changes, the above system was re-engineered using a RDBMS platform (Oracle-Developer 2000) by Price Waterhouse Associates (PWA) during 1997-2000 at a total cost of Rs.32.85 lakh. But as per observed that there was no policy regarding the identification and classification of the data/programs of the HT billing into critical, sensitive and confidential categories based on risk analysis and risk mitigation methodology [2]. Although backups of HT billing data were being taken at periodical intervals, there was no formal policy regarding the frequency of test checking the backups for recovery [5]. Neither the backups so obtained were tested periodically nor any logs maintained in support of such test checks. The billing system has poor general information technology controls especially regarding the security features such as access controls, passwords, login attempts and security breach reports. Thus the system was vulnerable to unauthorized access and data manipulation.

To overcome all these tradition difficulties in electricity billing system we are developing the E-Meter system. In E-Meter billing system for storage of data and readings of customer's electric meter we uses cloud as storage [1]. With Cloud Storage, you can store and manage access to any

amount of data, whether for an individual or a group [1]. Because of cloud storage the software can count on Google's world-class cloud storage system for reliability, almost unlimited scalability, and innovative functionality, including standards-based security features and sophisticated data-analysis tools [1]. The general data storage process can be time-consuming and costly. This includes maintaining data servers, storage disks, firewalls, backup copies and disaster-recovery provisions. Cloud Storage reduces these burdens, allowing you to store, retrieve, share, and analyze your data, day after day, without worrying about maintenance, scaling up or down or hardware and firmware upgrades [5]. Cloud storage typically refers to a hosted object storage service, but the term has broadened to include other types of data storage that are now available as a service, like block storage. Cloud storage is made up of many distributed resources, but still acts as one - often referred to as federated storage clouds. Cloud storage is highly fault tolerant through redundancy and distribution of data [1]. It is highly durable through the creation of versioned copies too. Performance for outsourced storage is likely to be lower than local storage, depending on how much a customer is willing to spend for WAN bandwidth. Reliability and availability of cloud depends on wide area network availability and on the level of precautions taken by the service provider. Another important part of E-Meter billing is android operating system.

Android is the most popular mobile operating system as of 2013, android devices sell more than windows, ios. As of 2013 the Google play store has had over 1 million android apps published and over 50 billion apps downloaded. A developer survey conducted in April-May 2013 found that 71% of mobile developers develop for android [4]. Android is popular with technology companies which require a ready-made, low cost and customizable operating system for high-tech devices [3]. At Google I/O 2014, the company revealed that there were over 1 billion active monthly Android users (that have been active for 30 days), up from 538 million in June 2013. In E-Meter billing system we use android phones and cloud as the storage, these both technologies are having many advantages over previous technologies. So the E-Meter system increases the efficiency and provides an upgraded and faster platform for billing which would result in timely generation of bills.

E-Meter reading system is a fast easy way for electricity billing process. It overcomes all the disadvantages of existing system & provides a reliable solution with just simple 3 steps. Firstly employee snap photo enter reading & send to server for process within millisecond server process bill & send to customer using mobile messaging system & finally customer pay bill with different online payment methods.

II. RELATED WORK

Until the related work of this project is just paying online payment through online banking rather than considering bill generation point of view.

Traditional way of electricity bill process is so long, time consuming & required more efforts & cost. Firstly employee takes photo of electricity meter for each customer & makes entry to exchange office & upload photos. After that MSEB server process that data & generate bill, send it to exchange office from exchange office bill forwarded to individual

customer door to door. This process evolves more than 3 employees to process each bill & require 10 to 15 day.

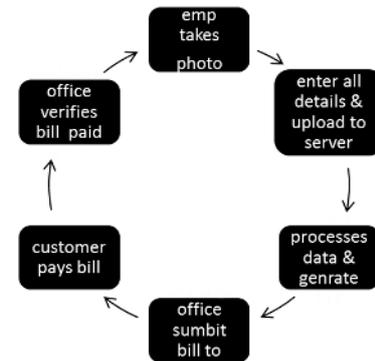


Figure 1. Traditional approach for Electric bill generation

E-Meter reading system is a fast easy way for electricity billing process. It overcomes all the disadvantages of existing system & provides a reliable solution with just simple 3 steps. Firstly employee snap photo enter reading & send to server for process within millisecond server process bill & send to customer using mobile messaging system & finally customer pay bill with different online payment methods.

III. FEASIBILITY OF THE SYSTEM

Feasibility study is second stage in the "system Development life cycle". According to result of preliminary investing examine the system feasibility & like hood that the System will be beneficial to organization. For feasibility some points are considered like: any other creation is available for particular task that is beneficial.

All the projects are feasible if unlimited resources and unlimited time is given. Practically, it is not possible to provide unlimited resources and unlimited time to any project. The development of the computer based System is more likely to be affected by lack of resources and time deadlines. During the analysis, the feasibility study is performed, based upon the following point:

A. Technical feasibility

The today's Meter billing system has many disadvantages it is now generally preferred. E-Meter system is now more efficient and effective than previous system. There is need of related object and software. So all this technical part should consider in this system.

B. Economical feasibility

Any system newly developed needs some initial investment. These are concerned with the cost of incurred for the development & implementation of software product [4]. The E-Meter software product is derived from it the cost involved is that of coding, implementation of software product hence the system is economically feasible.

C. Operational feasibility

The system will be easy to use. The system will perform all the validation will be very user friendly & easy to understand by user. The main user of the software will be Employee and people who need to have their knowledge. The proposed system being using an Android operating system based software is easy to operate and user friendly. As the software incorporate an intuitive interface, user need to have skill related to Mobile and PC.

IV. PROPOSED SYSTEM:

E -Meter reading system is fast easy way for electricity billing process. It overcome all the disadvantages of existing system & provide reliable solution with just simple 3 steps. Firstly employee snap photo enter reading & send to server for process within millisecond server process bill & send to customer using mobile massaging system & finally customer pay bill with different online payment methods.

E-Meter reading system is fast easy way for electricity billing process It overcome all the disadvantages of existing system & provides reliable solution with just simple 3 steps. In this proposed system functionally Requirements are only validate Employee must be login, it exporting task and also it is possible to view the pending work. Employee capture the Meter picture and possible to uploading on server as well as automatic bill generate at server with considering pending records. Generating bill notify to customer with their meter Id, name and their payable bill. Possible to Customer pay bill the bill through this proposed system.

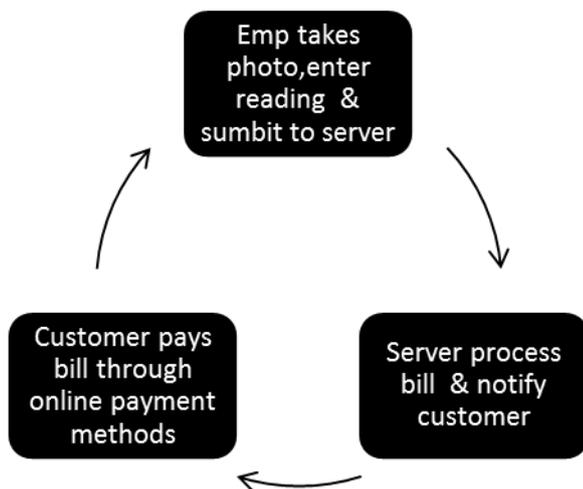


Figure3. Steps of processing bill.

A. Units

The whole project is broadly classified into two modules , it shows as follows.

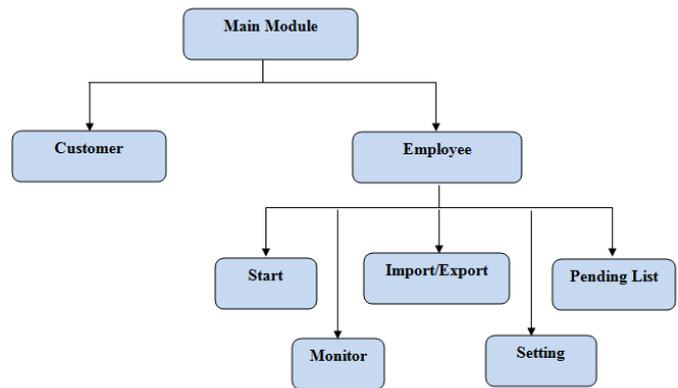


Figure 2. Broad classification of units

- Customer :

On a customer panel, customer login with his ID and password .Customer can view all the details regarding to the billing process, previous pending bill, current meter readings and previous history about billing. Customer can pay the bill via m-paisa and online bill transaction through this panel. Customer can report some problem regarding to billing process and about faulty meter to the MSEB administrator.

- Employee :

Firstly employee login with his own employee ID and secret password. A new window is open that contain sub modules are as-

a) *Import/Export* : first Employee import the todays whole record with entering month and **pc/bu/dtc** from server.

b) *Monitor* :In this unit all imported data had shown with its status. Status field indicate that the particular which meter are still remains [5].

c) *Setting* :In this moule unit employee can manage application in its own restricted way. i.e change current password,clear data etc.

d) *Pending List*: It shows the pending records. Pending records means those electric meter having still remaining for submit its record on server machine.

e) *Server* : snap photo enter reading & send to server for process within millisecond server process bill. it take the input data that are send by employee and process over on it. Server import whole record about that customer meter number i.e current reading, pending reading, charges, interest etc. process over it and genrate final bill and send notification to the customer ,store current record on its database [5].

B. Mathematical Equations

1. Mathematical Model for sending notification to the customer by server

$$\text{Let } U = \{u_1, u_2, u_3, u_4, \dots, u_n\}$$

be the set of N number of users.

$$\text{Let } M = \{m_1, m_2, m_3, m_4, \dots, m_n\}$$

be the set of N number of meters.

We formulate our problem as

For a set of 'N' users {u1, u2, u3, u4, un} given

For a set of 'M' meters {m1, m2, m3, m4, mn}

Where $N \leq M$.

we aim to send notification to N users for respective m meter.

2. Mathematical Module for Bandwidth

Bandwidth (μ) = No. of bits per sec.

1 Byte = 8 Bit

$\mu = \text{no. of bytes (B)} * 8$

No. of Bytes (B) consist of

- 1) Image Size
- 2) Data

e.g.

Consider,

Image Size = 400KB = 409600 Byte

Data = 50KB = 51200 Byte

So, The Bandwidth is

$\mu = \text{No. of Bytes} * 8$

$\mu = (409600 + 51200) * 8$

$\mu = 460800 * 8$

$\mu = 3686400 \text{ Bits/sec.}$

V. SYSTEM ARCHITECTURE

System Architecture consist of three layers as follows

- 1) Customer Unit and Employee Unit
- 2) Data Storage
- 3) Manager Unit and Admin Unit

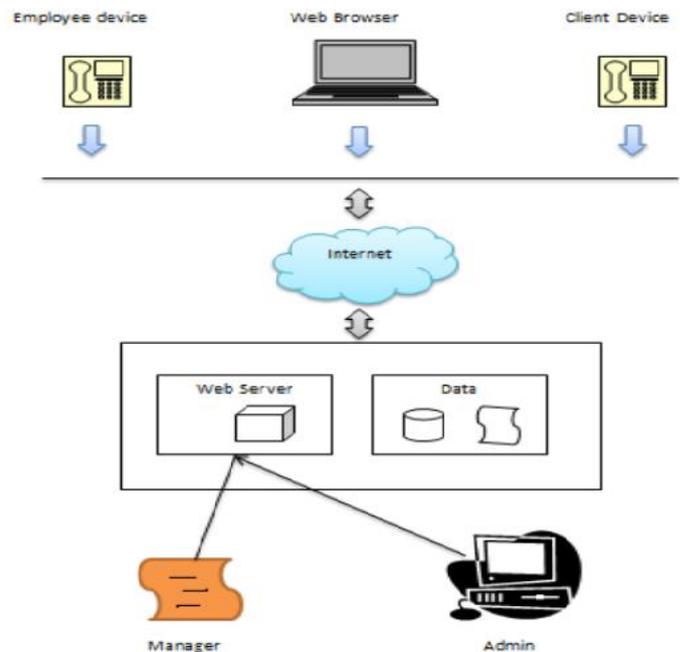


Figure 3. System architecture.

1) Customer Unit and Employee Unit

It is an application that interacts with a user as well as an employee [2]. The customer panel is for a customer having an MSEB meter. On a customer panel, a customer logs in with his ID and password. The customer can view all the details regarding the billing process, previous pending bill, current meter readings, and previous history about billing. The customer can pay the bill via m-paisa and online bill transaction through this panel. The customer can report some problem regarding the billing process and about a faulty meter to the MSEB administrator.

An employee logs in with his ID and password provided by MSEB. Employees import the data of a specific area from the server. The employee captures the image of the meter and enters the reading after that sends it to the server. The servers process the data and generate the bill including the previous pending bill.

2) Data Storage

Data Storage is used for storing the images and meter data after that the customer and employee enter some information related to the meter that also stores on Data Storage. For the data storage, cloud technology is used [1].

3) Manager Unit and Admin Unit

In the Manager unit, the manager logs in with ID and password. The Manager Unit is for solving the query of the customer and the manager can retrieve, update the data that are in data storage. Admin is the only person that has the authority to change the data and manipulate data.

VI. CONCLUSION

In order to improve flexibility, efficiency and break the constraints of time and space. A mobile based android application for electric bill is proposed and realized in the paper. The mobile based app used Android technology as the communication media. To accommodate with the characteristic of portable devices, the system was designed for low power consumption and low cost. With the help of the proposed system the employee of electric board can directly capture image of electric meter, insert customer number and units of electricity consumed. All these data will be transferred to the server and respective changes will be updated into customers account according to customer number and bill will be generated. Customer will be notified about their electric bill via notifications using Google Cloud Services or text message. Customer can pay bill using different payment method like M-Paisa, credit card, debit card etc.

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