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# DEVELOPMENT OF AN ANDROID APPLICATION FOR ELECTRICITY BILL PAYMENT

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**ABSTRACT:**

*Android is a mobile operating system (OS) based on the Linux kernel and is an an open-source mobile operating system currently developed by. Android is the most widely used mobile OS and, as of 2013, the highest selling OS overall. Android devices sell more than Microsoft Windows, iOS, and Mac OS X devices combined. In last few decades Mobile apps offer unprecedented opportunities for streamlining business processes - especially as they become more prolific. The appearance of mobile platforms based on open source software has rapidly increased the interest. This paper is based on building a mobile application for electricity bill payment in a simple and easy manner. Mobile phones are within an arm's reach of over 90 percent of waking hours, including times when other media are not available. So this methodology will be feasible than website payment. Moreover it provides convenience, speed and ease of use. We can also access and collect data whilst offline. The mobile app automatically synchronizes data in the background and stores it on the device, so that users can access data in the app even without connectivity. Captured data is also stored in the cloud so that no data is ever lost. This paper suggests a mobile based system to pay electricity bill and also notice lodge tour complaints to the electricity board.*

***Keywords: Mobile application, security, Android, mobile electronic payment, privacy.***

## I. INTRODUCTION

Android continues to be one of the leading mobile OS and development platforms driving today's mobile innovations and the apps ecosystem. Android appears complex, but offers a variety of organized development kits to those coming into Android with differing programming language skill sets. With the vast development and deployment of wireless mobile networks such as 3G UMTS [13], [14], WiMAX [9] and Wi-Fi [10], mobile networking applications enabling customers to gain network access anywhere and anytime have attracted more and more attention in our daily lives. When the basic functionalities of a wireless network have been in place, customers are now more interested in value added mobile applications over this network. Most mobile applications come with the emergence of electronic trading (mobile commerce or m-commerce), hence good secure mobile trading model must be designed to attract more mobile users for doing business wirelessly. With the rise of mobile devices and android applications which support the anytime anywhere feasible action, building an application for utility bill payment like electricity bill payment is mandatory. The ultimate thing is, as of now there is no live application for Tamil Nadu Electricity Bill Payment in any market. We have done a frame work on mobile application which makes use of instant payment method. Generally every human needs to

stand in the queue for paying bills and online sites are also not handy as mobile application. So this application tries to eradicate the drawbacks of existing payment methodologies such as manual and online payment by bringing the easier mobile application payment. The implementation of this application will have a great impact during peak working hours of our day to day life. And we hope that enormous number of people will get benefitted by this application

## II. PROBLEMS IDENTIFIED IN EXISTING SYSTEM

Electricity bills are the ones which are unavoidable in the current society. There can be no home without electric current supply. Electricity bills should be paid once in two months and more than one lakh people should pay bill every month. This leads to long queues in TNEB office. Online website can crash sometime if there is a large load i.e., large amount of people trying to pay at the same time. Our mobile application project will solve all these problems and it will provide an easy way to pay electricity bill by staying at home or wherever you are. It is reliable, efficient and accurate to suit all the requirements.

**2.1 Mobile Payment: A Journey Through Existing Procedures And Standardization Initiatives:** Mobile Payment (MP) is a promising and exciting domain that has been rapidly developing recently, and although it can still be considered in its infancy, great hope is put on it. If MP efforts succeed, they will boost both e- and m-commerce and may be the killer service in 2.5G and beyond future ambient intelligence infrastructures. Simplicity and Usability, universality, interoperability, security, trust and privacy are the basic customer expectations from the mobile network.

**2.2 Mobile Commerce Applications and Services: A Design and Development Approach:** A new approach for designing and developing m-Commerce services and applications were given in organized based on the needs and requirements of the user. MBusiness can be seen as the natural successor to eBusiness [1] This approach relies on mobile users needs and requirements, the classification of the m-Commerce services and applications, as well as the current technologies for mobile and wireless computing and their constraints. Another important factor in designing m-Commerce services and applications is the identification of mobile users requirements. Classified based on the functionality they provide to the mobile users – (i) the directory (ii) the transaction-oriented services and applications. M-Commerce services and applications can be adopted through different wireless and mobile networks, with the aid of several mobile devices. [1]

**2.3 Professional Android Application Development**: By providing an open development platform, Android offers developers the ability to build extremely rich and innovative applications with a rich set of User Interfaces, support for broad range audio and video file formats. Developers and mobile handset manufacturers around the world has embraced this new platform due itsopens-source and diverse application development and running capabilities with programming language as Java. Creating various android applications and activities which are more useful in daily life have been easy by the Android development tools which provide easier way for creating User interfaces. [2] Creation of Intents, broadcast receivers, adapters and the Internet have been

introduced in android applications to make the system feasible among large number of users. Peer to peer communication, data storage. retrieval and sharing can be achieved in a button click through android devices.

**2.3 Android Suburban Railway Ticketing:** The Android Suburban Railway (ASR) ticketing is mainly to buy the suburban tickets. [5] It was one of the first mobile application where the ASR ticket can be bought in your smart phone using a QR (Quick Response) code.

**2.4 A Secure Mobile Electronic Payment Architecture:** There are a few payment models proposed in the literature [2], [21], which can be classified into two categories: the traditional payment model and the micropayment model. The examples of traditional payment models include the credit card platforms [5], [1], [24], [23] and the electronic cash platforms [6], [25], [8]. The traditional payment models allow only one payment in a *payment transaction*, which has been widely adopted for the event-based applications. Since a sessionbased application usually requires multiple payments during the execution of this application, with the traditional payment model, it requires multiple payment transactions to complete a session-based application. This is inefficient because heavy signaling and computational overheads are introduced into the network. On the other hand, the micropayment models allow multiple payments in a payment transaction, which is considered more efficient than the traditional payment model. Thus, the micropayment models [32], [14], [31], [27] are often adopted for most of mobile applications.

A secure trading model named *Mobile Electronic Payment (MEP)* for wireless mobile networks, which applies the emerging ID-based cryptography for key agreement and authentication is used. Our MEP attempts to alleviate the computational cost, reduce the memory space requirement in mobile devices, and meet the requirements for secure trading: avoidance of overspending and double spending, fairness, user anonymity and privacy. [9]

## III. UTILITY BILL PAYMENT MOBILE APPLICATION:

Some states in India have developed the electricity bill payment mobile application. But Bill history and complaint submission options are not available in these mobile applications. [8]

Our model proposes a system which will be feasible than website payment and the all other previous applications. Moreover it provides convenience, speed and ease of use. We can also access and collect data whilst offline. The mobile app automatically synchronizes data in the background and stores it on the device, so that users can access data in the app even without connectivity. Bill Payment is done securely. It also displays the previous bill history and allows the user to lodge complaints to the electricity board within an arm's reach. Sociological factors play a role in the choice of communication channels, methods, and overall effectiveness of any system. Social media and new technologies have been explored for their benefits to citizens and governments to improve services and communications [11].

**3.1 OBJECTIVE OF THE MOBILE APPLICATION:** We develop an android application to overcome all the problems slated above. The user registers himself into the application by providing his EB consumer

number. Once registered a confirmation mail is sent to his email id. The registered user can pay his electricity bill via credit/debit card or net banking. The user can also view his previous bill history and number of units consumed. The general complaints can be lodged via the same mobile application.

## IV. SCOPE OF THE MOBILE APPLICATION

Our application saves time and energy by allowing the users to pay electricity bills by staying at home or anywhere itself. It is secure and reliable as every user uses their unique EB consumer id and payment is securely done via net banking or credit/debit card. Complaints can be lodged via a single tap in the mobile application to the Tamil Nadu Electricity Board.

## V. MODULES IN PROPOSED ANDROID APPLICATION

The admin has the rights to maintain all user records, EB bill accounts and complaints. He can add the customer as new customer is added in the electricity board. He also displays the paid and unpaid bill details along with the previous bill history.

The Users are the consumers of TNEB for whose feasibility the application is developed. The user Registers for the first time which is authenticated by the admin. This leads to account creation. The user can pay his bills securely through the mobile payment gateway of his respective bank. Net banking, credit and debit card options are available for easy transaction of monetary funds via the mobile application.

## VI. THE MOBILE ELECTRONIC PAYMENT PLATFORM

In this section, we present the MEP platform which follows the general trading model. When a new user **U** or a mobile application/content provider **P** joins the MEP, the Key Distribution procedure (to be elaborated later) is executed to distribute **U** or **P** public-private key pairs denoted as ($k_{pub,u}$, $k_{pri,u}$) or ($k_{pub,p}$, $k_{pri,p}$), respectively. Then, **U** can purchase a mobile application from **P** by running a payment transaction. In a payment transaction, the signaling messages exchanged among **O**, **U**, and **P** are encrypted using three symmetric keys $k_{u-o}$ (held by **O** and **U**), $k_{o-p}$ (held by **O** and **P**), and $k_{u-p}$ (held by **U** and **P**). The three symmetric keys are updated (by utilizing the public-private key pairs) at the beginning of every payment transaction. A payment transaction consists of three phases, the Withdrawal phase (where **U** obtains te tokens from **O**), the Payment phase (where **U** uses the tokes to purchase a mobile application from **P**), and the Deposit phase (where **P** redeems the obtained tokens from **O**). [12]

The Dbt algorithm is used is to operate on databases containing transactions Each transaction is seen as a set of items (an *itemset*). Given a threshold $C$, the Dbt algorithm identifies the item sets which are subsets of at least $C$ transactions in the database. Dbt uses a "bottom up" approach, where frequent subsets are extended one item at a time (a step known as *candidate generation*), and groups of candidates are tested against the data. The algorithm terminates when no further successful extensions are found. Dbt uses breadth-first search and a Hash tree structure to count candidate item sets efficiently. It generates candidate item sets of length $k$ from item sets of length $k-1$. Then it prunes the candidates which have an infrequent sub pattern. According to

the downward closure lemma, the candidate set contains all frequent $k$-length item sets. After that, it scans the transaction database to determine frequent item sets among the candidates. The pseudo code for the algorithm is given below for a transaction database $T$, and a support threshold of $\epsilon$. Usual set theoretic notation is employed, though note that $T$ is a multiset. $C_k$ is the candidate set for level $k$. At each step, the algorithm is assumed to generate the candidate sets from the large item sets of the preceding level, heeding the downward closure lemma. $count[c]$ accesses a field of the data structure that represents candidate set $c$, which is initially assumed to be zero. Many details are omitted below, usually the most important part of the implementation is the data structure used for storing the candidate sets, and counting their frequencies.

Dbt(T, Є)

$L_1 \leftarrow$ {large 1 - itemsets}

k ← 2

while $L_{k-1} \neq ø$

$C_k \leftarrow$ { a U {b} | a Є $L_{k-1}$ ∧ b Є U $L_{k-1}$ ∧ b Ɇ a}

for transactions t Є T

$C_t \leftarrow$ {c | c Є $C_k$ ∧ c ⊆ t }

for candidates c Є $C_t$

count[c]←count[c]≥Є}

$L_k \leftarrow$ { c | c Є $C_k$ ∧ count[c] ≥ Є }

k←k+1

return ⋃ $k$ $L_k$

In addition to this the user can also view the detailed list of his previous bill history of all the paid bills. He can also lodge complaints to the Tamil Nadu Electricity Board by entering his specified consumer number and complaint.

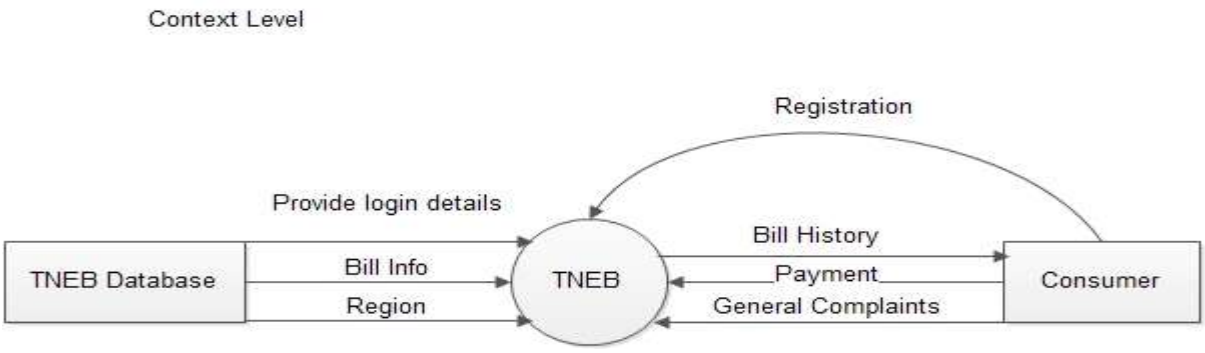


**Figure 1: Context Level Diagram**

Figure 1 shows the functionality of the entire system in the single context diagram. The consumer can register/login via the mobile application. After successful registration the consumer can pay bill, view previous bill history and also lodge his general complaints via the mobile application. All the consumer details are managed in the backend by the administrator.

The overall system architecture diagram is shown in figure 3. Any user can register in this mobile application can thereafter login to perform the desired operation. This eases the overhead of going to the electricity board in person and pay bill. It is also handy and useful since it helps us to pay bill instantly.

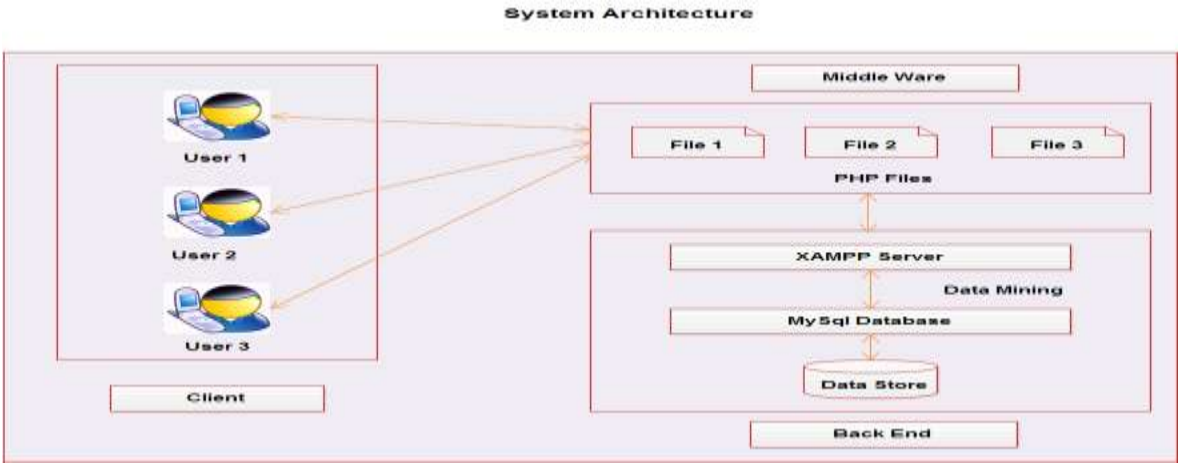


**Figure 2: System Architecture**

## VII. EXPERIMENTAL RESULTS

Personal Communication Services refers to a wide variety of wireless access and personal Mobility Services provided through a smaller terminal with the goal of enabling communication with a person at any time, at any place, and in any form. [15] Usage of Mobile Application designed to run in smart phones also continuously expanding and providing best mobility services. Hence our application will be more useful for all the consumers. The step by step flow of each and every phase is explained in the following figure 3. The experimental results include the registration phase and login. After which the consumer can pay his bill instantly and also additionally view his bill history and lodge general complaints to the electricity board.

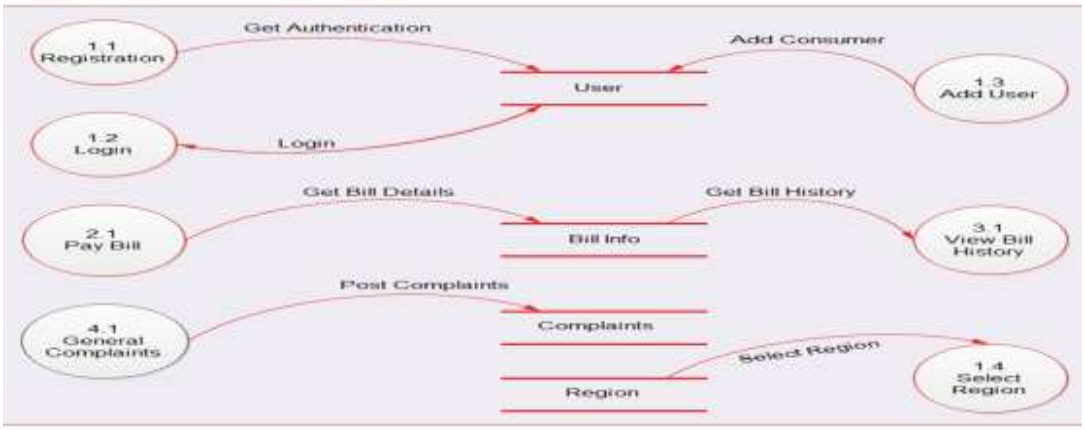


**Figure 3: It shows a detail flow of each and every entity. The systematic flow in each step in shown.**

With the rapid development of the wireless internet and mobile computing, more and more mobile-based services penetrate in business and personal life. We expect that our mobile payment application will provide a viable trading model for the future mobile applications and play an important role in the emerging m-commerce industries.

## VIII CONCLUSION

This research focuses on the design and the integration of an optimized method for developing a bill payment application. Our thorough analysis suggests Android offers developers the ability to build extremely rich and innovative applications with a rich set of User Interfaces which will be useful to enormous number of people who will be benefitted at an arm's reach. Apart from the overheads of displaying the tariff units by using Power meter billing, Electricity bill payment mobile application has greater advantage and greater efficiency.

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