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## Advanced billing system for government departments

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### ABSTRACT

*Making payments for electricity, water, a property is more of a routine job which needs to be done but often delayed mainly due to its tedious nature. Also getting access to various details of the same is also tedious. Earlier the existing system was manual payment methods where the user needed to visit the nearby payment centre and pay their respective bills. The proposed system is more secure, error free and easily incorporable to any further developments and changes to build an application program to reduce the manual work of managing amount of units consumed by the costumers and generating the bills for various departments like the municipality, electricity and water department.*

**Keywords**— *Billing system, Bill payment, Bill generation*

### 1. INTRODUCTION

Billing system is to make life easier for a customer. It is a basic customer care tool which also ensures that the company obtains payments in time. Before setting up a billing account, the personal information of customers is analysed. The customers' credit worthiness is the main information which an agency will pay attention to. After all the information is obtained, the customers' billing systems are established. So based on this existing system a new method is introduced that is an advanced billing system. The proposed model that tried to make the payment of various government institutions simpler, secure and maintain the database as compared to other existing system. To proposing advanced system must build an application program and that reduce the manual work of managing amount of units consumed by the public users and generating the bills for various departments like the municipality, electricity and water department. In an application giving an authority to one administered for the billing process that included taking details of public users, checking payment details etc. Public Users use these services and pay their payment regarding to corresponding bills. All process going with the help of internet services with implemented using Java servlets as front end and MySQL as backend.

### 2. THE EXISTING SYSTEM

Making payments for electricity, water, property is more of a routine job which needs to be done but often delayed mainly due to its tedious nature. Also getting access for various details of the same is also tedious. Earlier there existed manual payment

methods where the user needed to visit the nearby payment centre and pay their respective bill. Also getting access to the track records of the older payments made was almost impossible. Although a few online payment methods have been introduced recently they lack security. The details of the same are not maintained and vaguer in nature. A single platform to get an access to all the details and also to make the payment at the same time is missing

### 3. THE PROPOSED SYSTEM

The proposed System build with web application and system is made to keep the records about the bills of the users. The administrator can manage all the user accounts like adding the user details for all the three domains namely Electricity bill, Water supply and property Tax payments. Once the user registers by providing appropriate details, an alert message is sent for the registered customers about their first time registration with username and password. The registered users then can login and manage their accounts like details of their accounts, also about bill generation and alert messages. The users can pay the bill from either a single domain or all the three at a time. This system helps in maintaining the bills and payments for above mentioned domains. Here initially admin takes the details of the user and registers it to his database, at the time of registration a unique bill number is generated for every new user (same for all three domains), with that unique bill number, admin generates the bills for the registered user's. Once it is registered, the user gets a user ID and password to his mobile number. Admin collects all the details of the tax, water and electricity bill and updates it to his database. The bill is generated, an alert message is sent to the registered users with details of bill number, paying amount and the due date. The user can opt to pay all the three domains at a time or can prefer individual payments also.

Admin maintains all the registered user's details, paid user's details and unpaid user's details. The users can login to application through the username and password which is sent to registered mobile number. Once the user is logged in, user can manage his account, view details of the bills of all the three domains (property tax, electricity and water). The user can choose any one of the provided three methods of online payment method. Net banking facility has also been provided for convenience. Once User pays the amount, the amount is send to respective department through the transaction ID and the receipt

is generated. The User can download his receipt through PDF forms. An application form containing the entire property details and dew amount to be paid can also be downloaded. The user if desired can also reset his password by providing correct details of his older password. There are a few third party online application where user can pay bill for above mentioned three domains separately and there may be no secure data transmission in a payment mode (that is while processing the payment by submitting the OTP there are chances of data stealing from the third party hackers while processing).

These are the everyday need of the citizens, hence each and every citizen can use this application, and this application is useful for both the Users and the department. The user can get easy accessing of the required information of various governmental institutions at the same the User can also pay bill of three domains in single application. It benefits both the users as well as the governmental institutions. It saves the user from paying extra amount as fine due to piled up dew payments also helps the governmental institutions to properly collect their revenues and hence avoid loss to the government. For security purpose AES algorithm is used here, this makes the payment more securely. This application is time saving and easy to handle. This is more user friendly application.

#### 4. LITERATURE SURVEY

**Zameema Benazir, Divya Prabha** in their paper “Electricity Bill Management System” has proposed is to build an application program to reduce the manual work for managing the amount of units consumed by the customers and generating the electricity bill according to the type of customer – individual or commercial. It displays the details of the customers, units consumed by them and bill history. It enables them pay their bill if not paid. The date of payment is updated while paying the bill.

It maintains error free database and easily incorporates the future developments and changes. Electricity Bill Management System using Java Swing and MySQL has been developed with the help of NetBeans IDE effectively. It is simple and user friendly. Since this system is implemented in Java, it is platform independent. It has wide scope for future expansion. All the manual as well as paper works can be fully eliminated in the billing branch. The accuracy and reliability are surely increased. It makes sure that unauthorized personal cannot execute this program. This system provides secured processing without any threats [1].

**Sherrie Hepsibah. E, Shreya. R, Suganya. J, Threas Divya.P** in their paper, “Development of an Android Application for Electricity Bill Payment” has proposed bill payment system through android application which is compatible for only with android cell phone. 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 is more 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 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

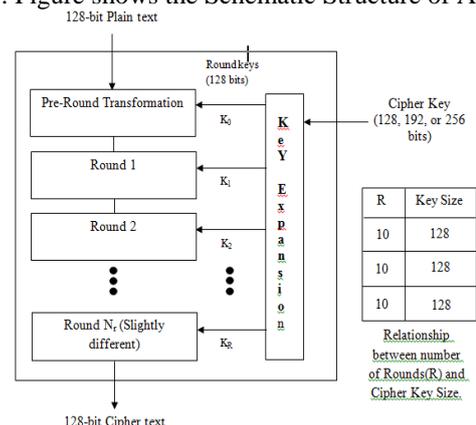
rich and innovative applications with a rich set of User Interfaces which is useful to enormous number of people who are benefitted at an arm's reach. Apart from the overheads of displaying the tariff units by using Power meter billing, Electricity bill payment mobile application has greater advantage and greater efficiency. [2]

**Wang Jue** in his paper, “Design and Implementation of Property Tax Grid Management System”, have stated as rapid development of real estate industry which is became an important source of local tax revenue. Implementation of the real estate tax "integration" is necessary to improve the scientific, standardized and intensification management level of the real estate tax, which is exploration of management pattern of beneficial based on computer management, information sharing, link clasped, chain management, department coordination and joint control.

Taking deed tax and land usage tax as an opportunity, this paper starts from the perspective of the integration of collection resources; continuously strengthen department coordination to comprehensively push integration of real estate tax management. This system has realized the implementation of networking operation between tax collection and administration system and the business management department, not only get the authoritative data, but also enhance the strength of the collection and administration, which is a meaningful exploration and breakthrough. [3]

#### 5. AES ALGORITHM

The widely accepted, more popular and symmetric encryption algorithm that is encountered nowadays is the Advanced Encryption Standard (AES). It is approximated to be at least six time faster than triple DES. It can be a perfect replacement for DES as its key size is too small. With increased computing power, it is considered vulnerable against exhaustive key search attack. Triple DES which was designed to overcome this drawback is too slow. AES works on iterative technique rather than Feistel cipher. It works on the basis of ‘substitution–permutation network’. It possesses a series of linked operations, some of which involve replacing inputs by specific outputs (substitutions) and others involve shuffling bits around (permutations). Interestingly, AES is designed to perform all its computations on bytes rather than bits, because of which AES treats its 128 bits of a plaintext block as 16 bytes. These 16 bytes arranges itself in the form of four columns and four rows for processing as a matrix –Unlike DES, the number of rounds to annalise in AES is variable and depends on the length of the key. AES requires 10 rounds for 128-bit keys, 12 rounds for 192-bit keys and 14 rounds for 256-bit keys. For every round it uses a different 128-bit round key, which is calculated from the original AES key. Figure shows the Schematic Structure of AES.



**Fig. 1: Encryption process**

### **5.1 Byte Substitution (Sub bytes)**

With reference to the design, the 16 input bytes are substituted by looking up a fixed table (S-box). The result is in the form of a matrix of four rows and four columns.

### **5.2 Shift Rows**

Each of these four rows in the matrix is shifted to its left. Entries which 'falls off' are re-inserted on the right side of the row. Shift is performed as follows:

- (a) First row is unaltered.
- (b) Second row is made to shift one (byte) position to the left.
- (c) Third row by two positions to the left.

### **5.3 Mix Columns**

Using a special mathematical function each column of four bytes is now transformed. This function takes input as four bytes of one column and outputs four completely new bytes, which replace the original column. As a result, another new matrix is formed which consists of 16 new bytes. It has to be noted that this step is not performed in the last round.

### **5.4 Add Round Key**

The 16 bytes of the matrix can now be considered as 128 bits and are XORed to the 128 bits of the round key. If it is the last round, then the output is the cipher text. Or else, the resulting 128 bits interprets as 16 bytes and it begins another similar round.

### **5.5 Decryption Process**

The process performed for decryption of an AES cipher text is similar to that of the encryption process but in the reverse order. Each round has four processes which is conducted in the reverse order.

- (a) Add round key
- (b) Mix columns
- (c) Shift rows
- (d) Byte substitution

Although they are very closely related, since sub-processes in each round are in reverse manner, unlike for a Feistel Cipher, the encryption and decryption algorithms requires a separate implementation.

## **6. IMPLEMENTATION**

### **6.1 Login**

Login module contains various fields like username and password with one button called Login. In this section, admin logs in into the application to enter the user details for three domains (Electricity, Water Supply and Property Tax). Once the user enters the username and password which has been sent to the registered mobile number by admin, then user can view his/her details for the three domains which are mentioned earlier. When the admin logged into the application, admin able to do the following features namely enter user details, generate bill, Paid bills and unpaid bills.

### **6.2 Registration process**

Registration process contains various fields. The admin can select any one of the mode or all the modes to register the user details. After the details get filled and submit then this will move on to individual module to enter the remaining details. An important thing in this project is that the bill number for all the modes is generated automatically while registering process. While registering details into the electricity mode, water department and property, that individual contains various fields. In the all type, admin can select based on the requirement and also with the usage type. Type and assessment can be select based on the requirement of the user.

### **6.3 Bill generation**

For every one-month bill is generated automatically and all the required details to the registered mobile number. This bill generation can be applicable for all the three domains.

### **6.4 Payment mode**

This mode involves payments can be done in three modes namely Tez, Net banking and Credit/debit cards where the digital transaction happened. In this mode, the user can pay the amount very securely. Here AES algorithm has been used to make the payment securely. The payment option should be securely maintaining through AES algorithm where there are no chances of hacking for the thirds party users and payment is done to the respective domains through AES with alert popup for the individual domains.

### **6.5 User mode**

Once the admin registered the user details into the server and generate username name and temporary password to users. When username and password is entered, it takes to the user side server where user can find user details for all three domains (if user registered for all three) or only for registered one. The bill is automatically generated and user gets a message from the admin side. This can be seen under pay bill feature. If the user wants to pay the bill, user can pay for single domain or all the three domains at a time. This is an added advantage to a user where they can pay the bill through a single medium. Payment options are Net Banking, PATYM and Debit/Credit card. This is the finest method or a prototype where user can pay the bill in the single medium with the single entry of the details with three different domains. This reduces the required time and effort of the users to make bill payments and payment is securely done without any interrupt by the third party users. An added advantage of this project is that user can view his/her earlier details about bill payment and all details about the payment from the starting payment started.

## **7. CONCLUSION**

The application being developed for customer service. With the simple UI and using the web services as well as using cryptography achieved a secure and all in one payment for all modes and also centralized data management gives strength for everywhere accessibility and users self-modifying option removes middle agent muddle. The unique payment system, information confidentiality, easy to use these considerations in the system take another level for billing system.

In future services like internet service, pest control service, telephone services etc. can be integrated to this system. Also the application can be expanded by providing other basic services like the ones of Just Dial.

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