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Enenrgy Storage Device to Enhance Renewable Energy in Smart Meter for Normal and Solar Power Supply

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***Abstract:** In the existing system a smart meter (SM) measures a consumer's electricity consumption and reports it automatically to a utility provider (UP) in almost real time. SM privacy is studied by considering the presence of a renewable energy source (RES) and a rechargeable battery (RB), which can be used to partially hide the consumer's energy consumption behavior.*
In the proposed system they have deployed Li-Fi Technology for Total amount calculation. Li-Fi Transmitter is connected to the EB Server and another Li-Fi is connected to the house EB Unit.
Both Solar panel and the normal Power are interconnected as Hybrid Connectivity. Solar power is used when Power is cut. Charges are calculated based on the usage and notified to the corresponding owners. Android based payment is processed. Government Free 100 units are also included in this project.
Our application also provides some discount if Current consumption is less than the previous month and User is penalized if the same is increased. All the values are encrypted and can be accessed only by the permitted limited to their access policies using ABE Algorithm.

I. INTRODUCTION

The transition from the legacy power distribution network to the new power grid paradigm, the so-called smart grid (SG), is rapidly ongoing.

An SG provides many advantages for energy generation, transmission, distribution and consumption thanks to the use of information and communication technologies that enable SGs to monitor and control the power network more effectively. In addition, an SG eases the\ integration of renewable energy sources (RESs), which is a fundamental factor in reducing our dependence on fossil fuels and moving on to a low carbon economy.

A key feature of an SG is the advanced metering infrastructure, and in particular smart meters (SMs), which record and report the electricity consumption of a household. SMs that are currently being rolled out in the United Kingdom send measurements every 30 minutes, whereas those in Texas send every 15 minutes.

The frequency of SM measurements is expected to increase drastically in the near future when renewable energy integration increases and the energy market becomes more efficient by incorporating time-of-usage pricing and demand shifting .The installation of SMs is rapidly advancing worldwide.

For example, all European Union countries are required to have 80% SM adoption by 2020 and 100% by 2022. On the other hand, the information that is collected by SMs may be potentially used for other purposes, thereby raising the question of data privacy. By using nonintrusive appliance load monitoring (NILM) techniques, power consumption load profiles can reveal sensitive information, such as the users' habits, presence at home and working hours, potential illnesses or disabilities, equipment being used, and even which TV channel is being watched. First NILM devices were built in the 80s and were already able to detect the activity of some appliances by knowing their power signature.

Authors in showed that it is possible to detect users' activity by simply using off-the-shelf clustering and pattern recognition methods, even without any a priori knowledge of the appliances' power signature. The current state of the art is to consider a factorial hidden Markov model to model the total consumption of various household appliances, whose solution is, however, NP hard.

To solve this issue, describes a computationally efficient method based on a semi definite relaxation combined with randomized rounding.

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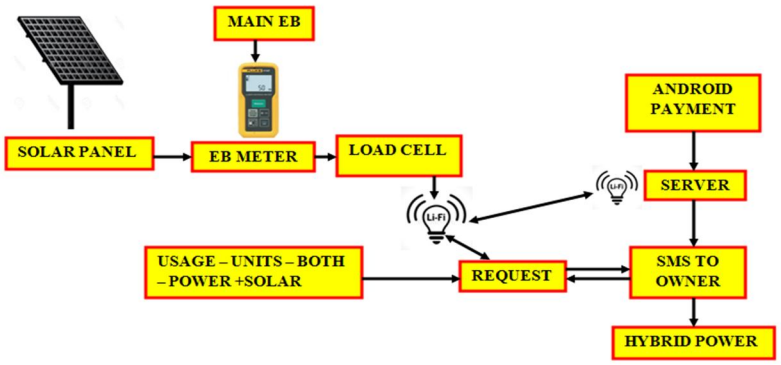
II. PROPOSED SYSTEM

In the proposed work SM privacy is studied by considering the presence of a renewable energy source (RES) and a rechargeable battery (RB), which can be used to partially hide the consumer's energy consumption behavior**.** Here the smart meter is used to prevent the privacy of the customer by taking the reading through the android. The payment can be made through mobile application. Li-fi technology is used to connect the EB in home with the main EB meter in the station. The readings will be calculated and the total amount for payment will be send to the user. All the values are encrypted and can be accessed only by the permitted limited to their access policies use ABE algorithm. ABE stands for attribute based encryption, is a type of public key encryption in which secret key of the user and the cipher text are dependent upon attributes. The architecture explains how the solar panel and the normal power is connected with the EB meter and the distribution of power to the appliances. If the power shuts then from the solar panel the power supply will be enhanced automatically.

III. ARCHITECTURE



A. Architecture Explanation

The main EB and the EB meter in the home is connected using Li-Fi. The payment is calculated according to the amount of current used. These readings are then intimated to the user through SMS and payment is done through the mobile app. All the details about the user is stored in the server. In case of power cut the solar power supply is automatically transmitted to all appliances.

B. Methodology/Algorithm Used

1) ABE algorithm

IV. IMPLEMENTATION OF MODULES

A. User Registration

In this module every user will be registered with the server and so every user has to give username, password, address, mobile number and other details. In the login module mobile user can login by their user ID and password and make request for their home, office or firm electric bill details. This request will be sent to the centtral server, mobile and collect data from it and response to the end user.

B. EB Server

In the main EB server all the details of the user are stored. LiFi boards are connected with the RS 232 Serial Port of the EB server. Real time mobile phone is connected with the EB Server for sending SMS to the customers regarding the amount information. This server will have the entire data of all the customers information.

C. User Behaviour Monitoring

In this module we monitor the behaviour of the user,the usage of current monitoring,TV programming monitoring and if the current charge go beyond the limit it will charged double.

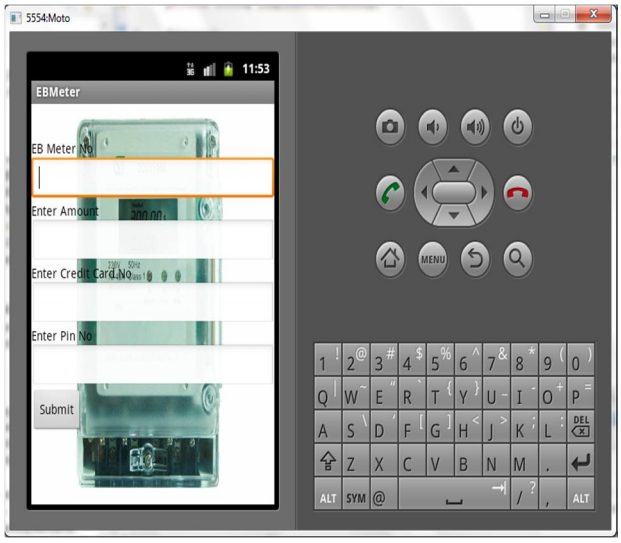
D. LiFi Communication

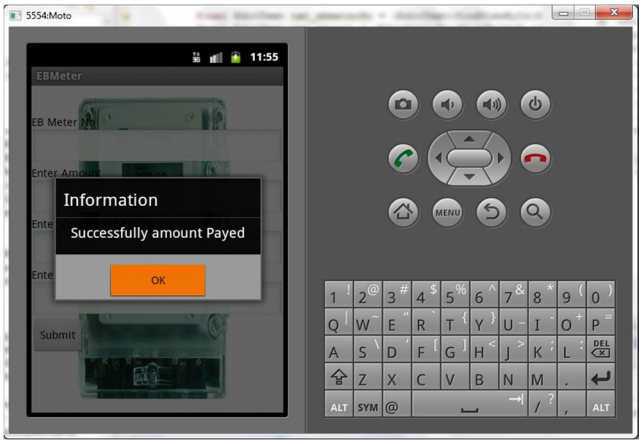
In this module we use advanced technology LiFi, through the LiFi we can able to transfer the file through the light. So in this project we deploy a LiFi communication for data communication between the EB meter and server

E. Android Payment System

User can give the payment through online itself. So that this process reduces customers going directly standing in the queue to pay money. And the payment system is developed by android application so that the user can pay by his android phone.

Screenshot





V. CONCLUSION

We have studied information leakage in an SM system by considering an RES along with an RB. For infinite and zero battery capacities, we have provided single-letter information theoretic expressions for the minimum information leakage rate, which can be efficiently evaluated when the input load has a discrete alphabet. Using ABE algorithm we secure the information.

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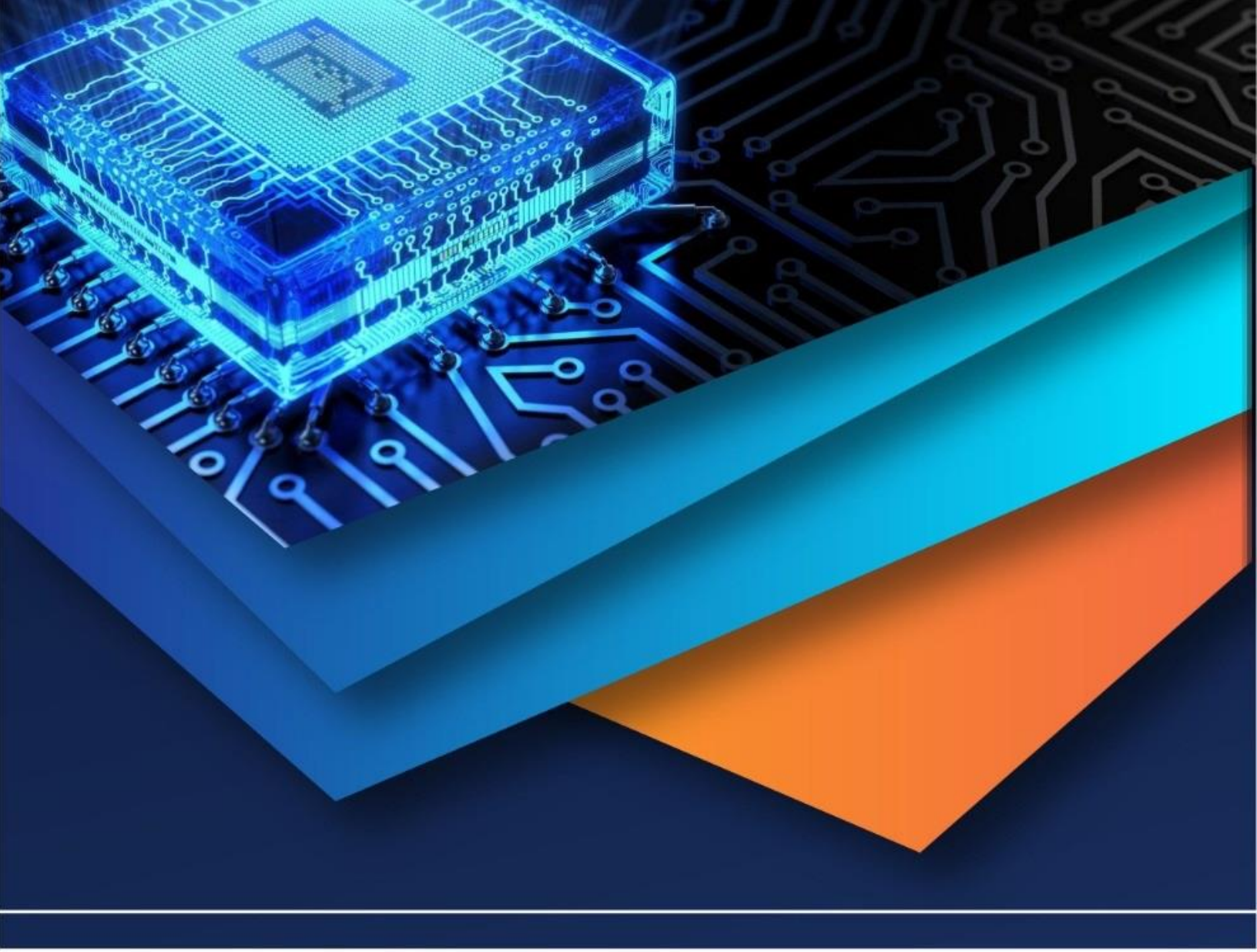

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