Reduced Energy Management on Atm's Air Conditioners using Iot

w. ancy breen, s. muthu vijaya pandian, praveen talari

Abstract: ***The banking system in India has more than one lakh plus Automated Teller Machines (ATMs) in our country. According to the Reserve Bank of India (RBI) data, India had 215,039 ATMs at the end of June 2017. The average daily power consumption comes around 5520W in small bank ATM's. Our proposed system "SEMS (Smart Energy Management System)" is a system to manage the domestic and industrial energy consumption and save electricity usage and money by using IOT (internet of things). It enhances productivity and efficiency, improve real-time decision making, solve critical problems, and create new and innovative experiences. Our proposed idea is the implementation of "Smart Energy Management Solution" at ATMs across India to save the energy, cost and to find out the power tampering in that area. Email Alerts will be sent in case of Power Tampering. Energy Automation improves enhanced usage of energy. Simple analysis reports on current and history of energy usages. Thus our proposed system helps to achieve remarkable savings on energy and money.***

KEYWORDS: ATM machines, Energy, SEMS, GPRS, IOT Devises.

I. INTRODUCTION

The pivotal role that ATM and financial sectors plays in the economic growth and stability, both at national and individual level, requires continuous and reliable services. A normal ATM consumes around 200Watts to 500Watts and the total power required along with uninterruptable power supply and A/C would be above 1000Watts[Gupta Y., et al(2017)] . This 1000Watts power may not be available for ATM deployments in rural/ semi urban areas for 24x7 operations[Yang H., et al(2014)] . Due to market pressure many ATM are installed without AC because of high power rate which affects the ATM parts that are designed for better performance. Internet of Things means connecting internet with other devices and hardware and to connect to other devices. The IoT is a giant network of connected things and people all of which collect and share data about the way they are used and about the environment around them[Castellani A P., et al(2010)]. Many devices with sensors and objects are connected to IOT concept, which generates data from the different devices and are used to analyze and then are shared to obtain valuable information with some applications that are built to address specific goal.

II. LITERATURE SURVEY

Energy Conserving Medium Access Control involves the design and analysis of scheduling algorithms. This paper overcomes the problem of burst errors and location dependent errors. No special algorithm for virtual time so the complexity of the algorithm is reduced. Discrete event simulation uses more realistic multimedia traffic models. Low battery power for better quality of service for bandwidth allocation. The disadvantage is it does not include any power adaptation for prioritizing low power and high power mobiles in scheduling. It uses priority round robin algorithm with update in dynamic reservation and error compensation scheduling. Presentation of performance is done. It provides low power access protocol for mobile and wireless ATM networks[Li B., et al(2017)].

In this paper the information about the ATM users are analyzed and sensed using pyroelectric infrared sensors (PIR). It introduces the pyroelectric infrared sensors and an intelligent power saving mode to detect the ATM users. The complete status of these electrical devices are monitored and controlled by real time clock (RTC DS 1307). The PIR is used to detect the motion of occurrence of the project by analyzing the radiation of infrared levels in surrounding. When a user go to ATM counter the system will adjust brightness of lamp using PIR sensor and micro-controller and also switch on the indoor lamp and security camera. By using this method, we can reduce the power conception and requirement of storage up to 30 to 35% and also it helps to detect the theft and malfunctions on ATM counters. But it produces disadvantage in accuracy and sensing angle of PIR sensor[Abubeker K M., et al(2013)].

Efficient energy saving performance on buildings using applications on information communication, computer networks and automation control are used. The framework has energy monitoring and analysis system based on IOT to achieve real time monitoring and control. It strengthens the operation and management of the energy system using renewable energy hence improve the performance of thermal insulation and heating of air conditioners. It promotes the development of energy saving in intelligent buildings to achieve reduced energy consumption using energy saving technology – combination of modern

Revised Manuscript Received on July 05, 2019

Ancy Breen W, Assistant Professor, Department of Computer Science and Engineering, Vel Tech High Tech Dr.Rangarajan Dr.SakunthalaEngineering College, Chennai, India,

S.Muthu Vijaya Pandian, Professor, Department of Electrical and Electronics Engineering, SNS College of Technology, Coimbatore, India.

Praveen Talari, Assistant Professor**,** Department of Computer Science and Engineering, Vel Tech High Tech Dr.Rangarajan Dr.SakunthalaEngineering College, Chennai, India.

technology and energy use management methods. It uses the data centre information as the core to solve the energy management problems and enhance the energy monitoring system for energy consumption in buildings. The technology uses sensor networks and computer information processing, helps to analyze energy management and environment monitoring systems and enhance the environmental information on energy consumption[Wei C., et al(2011)].

This paper describes about a home model to describe energy efficiency in IOT based smart home. It uses several multi physics simulations which focus on the home model. A motion sensor along with surveillance camera is used for security system which is coupled with lamp and HVAC control system. This system can control the lighting and cooling or heating when someone enters the rooms. A disadvantage of this design process is that it is not enough to environmentally conscious to user but energy efficiency can be managed. Every wireless device has their own antenna modules which ensure the electrical wireless design constraints. Thus by coupling the electromagnetic simulations with thermal and structural simulations, the implementation of turning of the devices can be operated in virtual world[George S R., et al(2017)].

A. IOT BASED ENERGY MANAGEMENT:

The real-time energy management uses smart micro grids with RES and energy storages. Some algorithms are used for efficient energy management. The alternating direction method of multipliers (ADMM) methods will solve the problem in distributed fashion. Micro grids have much smaller financial commitments. It uses renewable resources which is more eco-friendly with lower carbon footprints[Song W., et al(2017)]. They require very less technical support to work and depend more on automation. It is isolated from any grid disturbance or outage. The main problems that are experienced are disturbances in grid and outages that are felt by users along with frequency change, voltage fluctuations which affects the performance and life of equipment[Salman L., et al (2016)]. The resulting capacity has to match the load, which increases the investment cost than estimated.

III. EXISTING SYSTEM

At present many products use many forms of energy saving devices and one such device that the air conditioners use is ISMART controller. It analyzes the temperature and helps to turn off the compressor in the air conditioners. It can able to control the energy usage and power bills for years [Jyh-Cheng Chen., et al(1999)]. The consumption of energy in air conditioners for improved efficiency in power utilization is reduced.

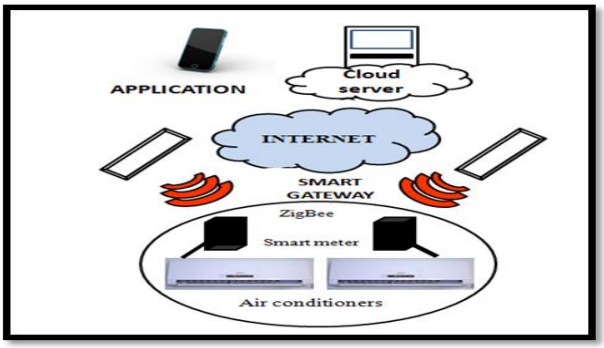

Fig 1- Smart Air Conditioners

It uses a smart controlling system which consists of smart meter, real time using cloud server. The programming interface helps to operate the gateway using ZigBee communication protocol to support extensible IOT development. The disadvantage is that it controls only the compressor of the air conditioners based on specific temperature. An extreme learning machine is required to analyze the distribution of energy for prediction of energy consumption. By this, smart meter helps to control cooling and heating of the compressor to understand the local energy management. Though this concept has some positive influence on the reduction of greenhouse gas it fails to reduce the internal power consumption and shows degradation in service of air conditioners. This concept is shown in the Figure 1.

A. DISADVANTAGES OF EXISTING SYSTEM

- Chances of performance degradation in air conditioners.
- Only compressor can be turned off.
- Energy is not conserved as predicted [Jyh-Cheng Chen., et al(1999)].
- An ATM counters is under continues use when air conditioners doesn't work the excess amount of heat generated by the computer can damage the systems.

IV. PROPOSED SYSTEM

Our proposed concept can manage both domestic and industrial energy consumption to save electricity and money. It helps to manage the real time energy usage by web application. Analysis report on current and history of energy usage can be generated. Our proposed concept has a dedicated hardware which consists of communication modem (along with GSM network), energy meter, temperature sensor, relays and ports, SMPS, parental board. Initially the temperatures in ATM counters are monitored using temperature sensor (LM35).

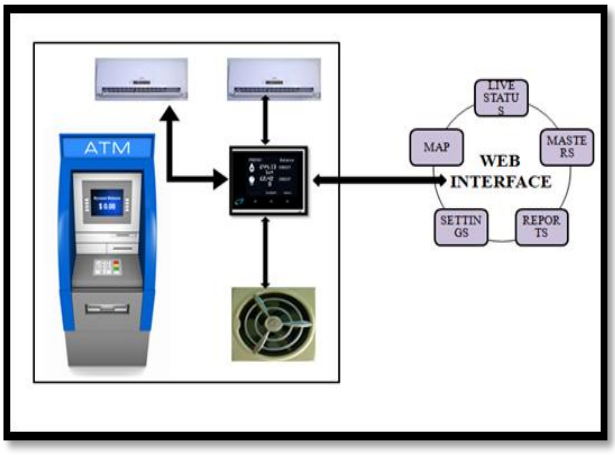

Fig 2- ATM Counters using sensor

The power passes through the 3-phase meter through SMPS. It consists of both auto and manual settings. Through web interface we are able to adjust the AC on-off settings in day and night modes. Scheduled power down information alerts on web. The energy saving is up to 40%. Online data monitoring is possible through web application of various parameters such as temperature, energy

conditions, theft identifications and other features. The Proposed concept is shown in Figure 2.

A. SYSTEM REQUIREMENTS

Hardware Specifications:

- Lm35,Whole Current 10-60 A, Energy Meter, Modem
- GPRS
- GSM
- Internet (3G / Wifi)

Software Specifications:

- HTML, Ajax
- Java, JSP
- Eclipse 4.5.2 (luna)
- Apache Tomcat 8
- Mysql

B.ADVANTAGES OF PROPOSED SYSTEM

- Air conditioners and its running schedules can be controlled remotely through web.
- Power failures can be indicated.
- Energy theft can be monitored.
- Asset information can also be monitored (light, camera, AC and others).
- Light control on signage board.
- Dedicated web portals make the users more convenient.

V. MODULES DESCRIPTION

A. LIVE STATUS DASHBOARD

Shows the Live Status Details of ATM ID, SEMS ID, Area, Last Sync, Mode Status, Temperature, and the AC Status for three phase meter. It shows the current working and synchronization timing of the AC in particular ATM.

MASTER MODULE:

List of Reports in the Master is:

- ATM MASTER
- ASSET MASTER

ATM MASTER:

The ATM MASTER consisting of inputting the below details about the atm master owner: state, district, area, bank, atm id, sems id, rphase load, yphase load, bphase load, action.

Back – end:

Select a.*,b.meterno as semsid,board as bankid, c.bankname, address, site_id as atmid, r_phase_load, y_phase_load, b_phase_load from (select a.stateid, a.state, b.districtid, b.district, c.areaid, c.area from atm_state a, atm_district b, atm_area where a.stateid =b.stateid and b.districtid =c.districtid) a, installation b join tbl_bank c on b.board=c.bankid where a.areaid =b.zone_id and meterno like '56%' .

asset master:

It consisting of inputting the below details about the asset master owner: ATM ID, PRODUCT, WATTE, NO OF UNIT, STAR RATING, AC TON, PHASE, REMARK.

Back – End:

Select a.*, b.site_id, c.PRODUCTNAME from atm_assets a join installation b on A.METERNO=b.meterno join atm_product c on a.productid=c.productid. insert into atm_assets(meterno,productid,watts,noofunits,starrating,action,remarks,phase)values (x,x,x,x,x,x,x,x)"

REPORT:

ENERGY CONSUMPTION:

It consisting of inputting below details about the energy consumption to client: STATE, DISTRICT, AREA, BANK, ATM ID, FROM DATE, TO DATE.

Back – End:

SELECT medat,SUM(Rkwh) AS Rkwh,SUM(Ykwh) aSYkwh, SUM(Bkwh)ASBkwh,SUM(Rkwh+Ykwh+Bkwh)ASTkwh, SEC_TO_TIME (SUM(AC1Rmin)*60) AS AC1Runhr, SEC_TO_TIME(SUM(AC2Rmin)*60)AS AC2Runhr,SEC_TO_TIME(SUM(AC1Rmin+AC2Rmin)*60) TRunhr, SEC_TO _TIME (SUM(Fanrmin)*60) AS Fanrunhr "FROM loadsurvey_sems a,installation b WHERE a.meterno= b.meterno AND a.meterno= '"+meterNo+"' AND medat BETWEEN '"+FROMDATE+ "' AND '"+TODATE ()+"' GROUP BY medata.

ASSET DETAILS:

It consisting of inputting below details about asset details like STATE, DISTRICT, AREA, BANK, ATMID.

Back – End:

Select a.*, b.site_id, c.PRODUCTNAME from atm_assets a join UVIEW_MAINMASTER b on A.METERNO=b.meterno join atm_product c on a.productid=c.productid and b.meterno = '" + ATMASSETID+ "' AND bankid = '"+BankAssetId () + "' AND areaid = '"+AreaAssetId () + "' AND districtid = '"+ DistrictAssetId.

INSTANT DETAILS

It consisting of inputting below details about the instant details to client like STATE, DISTRICT, AREA, BANK, ATM ID, BANK NAME, LAST SYNC&DATE&TIME, SEMS ID, PHASE TYPE, VOLTAGE, CURRENT, cum kWh, TOTAL cum kWh.

Back – End:

Select a.meterno, a.site_id, a.state, a.district, a.area, a.bankname from uview_mainmaster a, installation b where a.meterno = b.meterno and a.meterno LIKE '56%. SELECT STATEID, STATE,DISTRICTID, DISTRICT, AREAID, AREA,a.meterno,Address,site_id,bankid,bankname,c.RPV,c.YPV,c.BPV,c.RPC,c.YPC,c.BPC,c.RKWH,C.YKWH,C.BKWH,c.kwh,DATE_FORMAT (STR_TO_DATE (CONCAT (MEDAT, METIM),'%Y-%m-%d %T'),'%d-%b-%Y %T') AS INSDateTime, c.tempcl, c.ac1status, c.ac2status, c.fanstatus, c.lightstatus FROM uview_mainmaster a JOIN atm_sems_ instant c ON a.meterno=c.meterno WHERE a.meterno= '"+semsId+"'

TAMPER:

It consisting of inputting below details about tamper like from date, to date, atm id, sems id, rphase load, yphase load, pphase load, pphase actual load, yphase actual load, rphase actual load, record date&time.

Back – end:

Select site_id as atmid, a.meterno as semsid, area, r_phase_load, y_phase_load,

b_phase_load, r_act_load, y_act_load, b_act_load, insdate,instime from atm_tamper a join uview_mainmaster b on a.meterno=b.meterno and insdate between "'+tamperfromdate () +"' and "'+tampertodate () +"'";

Settings

Schedular settings:

It consisting of inputting below details about scheduler settings like atm id,sems id,ac on/off time,ac1 on/off time,ac2 on/off time,light on time,light off time,temp day mode,temp night mode along with start time end time settings.ac time settings (hh:mm): start time, end time, duration,ac1 time settings (hh:mm): on time, off time, duration,ac2 time settings (hh:mm): on time, off time, duration, light time settings (hh:mm): on time, off time, duration, temperature setting (day mode) °c: minimum, maximum,

Temperature setting (night mode) °c: minimum, maximum**.**

Back – end:

Select a.meterno, a.atmtime, b.site_id from atm_info a join uview_mainmaster b on a.meterno=b.meterno where a.meterno like '56%'

Ac on- off settings:

It consisting of inputting below details about ac on-off settings like state, district, area, bank change to, ac on/off.

Back – end:

Select a.*,b.fanstatus from (select a.stateid, a.state, b.districtid, b.district, c.areaid,c.area,board as bankid,address,measuring as location, site_id as atmid, d.master mno as acno, e.bankname, d.meterno from atm_state a,atm_district b,atm_area c ,installation d ,**tbl_bank** e where a.stateid=b.stateid and b.districtid = c.districtid and c.areaid= d.zone_id and d.board= e.bankid)a, atm_sems_instant b where a.meterno= b.meterno and (ac1status= "+status+" or ac2status = "+ status + ")

MAP:

It consisting of inputting below details about location of atms like state, district, area, bank atm id.

Back – end:

Select site_id as atmid, a.meterno as semsid, state, district, area, address ,tempcl, case when ac1status='on' then 'ac on' else 'ac off' end as ac1runningmode,case when ac2status='on' then 'ac on' else 'ac off' end as ac2runningmode,latitude,longitude, case when (date_format (str_to_date(concat(medat,metim),'%y-%m-%d %t'),'%d-%b-%y %t')*24*60)>30 then 'offline' else 'online' end as status from atm_sems_instant a join uview_mainmaster b on a.meterno=b.meterno and a.meterno = "' + atmidmap()+ "'and bankid = "' +bankmapid()+ "' and areaid = "'+ areamapid() + "'and districtid = "'+ districtmapid() + "'and stateid = "'+statemapid() + "'

VI. CONCLUSION

The importance of energy management in virtual world and the amount of energy consumed by varies ATM machines and their problems are overcome. Thus we can provide some solutions to manage energy in ATM using IOT devices. These devices with sensors and objects are connected, which integrates data from the different devices and applies analytics to share the most valuable information with applications built to address specific needs. The insight derived from data collected from IOT devices can be used to develop new services and also to improve productivity and efficiency along with improvement in real-time decision making, solve critical problems, and create new and innovative experiences.

REFERENCES:

1. Abubeker K M., Edathala J J., Sebastian S., Some investigations on ‘pir’ SENSOR and their application on significant energy savings in ATM counter, in: 2013 IEEE CONFERENCE ON INFORMATION AND COMMUNICATION TECHNOLOGIES, IEEE, Thuckalay, Tamil Nadu, India, 2013: pp. 37–41. doi:10.1109/CICT.2013.6558058.
2. Arshad R., Zahoor S., Shah M A., Wahid A., Yu H., Green IoT: An Investigation on Energy Saving Practices for 2020 and Beyond, IEEE Access. 5 (2017) 15667–15681. doi:10.1109/ACCESS.2017.2686092.
3. Castellani A P., Bui N., Casari P., Rossi M., Shelby Z., Zorzi M., Architecture and protocols for the Internet of Things: A case study, in: 2010 8th IEEE International Conference on Pervasive Computing and Communications Workshops (PERCOM Workshops), IEEE, Mannheim, Germany, 2010: pp. 678–683. doi:10.1109/PERCOMW.2010.5470520.
4. Gupta Y., Bajoria S P., Singh R K., Swathika O V G., IOT based energy management system with load sharing and source management features, in: 2017 4th IEEE Uttar Pradesh Section International Conference on Electrical, Computer and Electronics (UPCON), IEEE, Mathura, 2017: pp. 169–177. doi:10.1109/UPCON.2017.8251042.
5. George S R., Devidas A R., Ramesh M V., Smart personalized learning system for energy management in buildings, in: 2017 International Conference on Computation of Power, Energy Information and Commuincation (ICCPEIC), IEEE, Melmaruvathur, 2017: pp. 036–042. doi:10.1109/ICCPEIC.2017.8290335.
6. Jyh-Cheng Chen, Sivalingam K M., Agrawal P., Acharya R., Scheduling multimedia services in a low-power MAC for wireless and mobile ATM networks, IEEE Transactions on Multimedia. 1 (1999) 187–201. doi:10.1109/6046.766739.
7. Li B., Chen T., Wang X., Giannakis G B., Real-time energy management with improved cost-capacity tradeoff, in: 2017 IEEE Global Conference on Signal and Information Processing (GlobalSIP), IEEE, Montreal, QC, 2017: pp. 1045–1049. doi:10.1109/GlobalSIP.2017.8309120.
8. Song W., Feng N., Tian Y., Fong S., An IoT-Based Smart Controlling System of Air Conditioner for High Energy Efficiency, in: 2017 IEEE International Conference on Internet of Things (IThings) and IEEE Green Computing and Communications (GreenCom) and IEEE Cyber, Physical and Social Computing (CPSCom) and IEEE Smart Data (SmartData), IEEE, Exeter, 2017: pp. 442–449. doi:10.1109/iThings-GreenCom-CPSCom-SmartData.2017.72.
9. Salman L., Salman S., Jahangirian S., Abraham M., German F., Blair C., Krenz P., Energy efficient IoT-based smart home, in: 2016 IEEE 3rd World Forum on Internet of Things (WF-IoT), IEEE, Reston, VA, USA, 2016: pp. 526–529. doi:10.1109/WF-IoT.2016.7845449.
10. Wei C., Li Y., Design of energy consumption monitoring and energy-saving management system of intelligent building based on the Internet of things, in: 2011 International Conference on Electronics, Communications and Control (ICECC), IEEE, Ningbo, China, 2011: pp. 3650–3652. doi:10.1109/ICECC.2011.6066758.
11. Yang H., Lee H., Lighting Scheduling for Energy Saving in Smart House Based on Life Log Data, Procedia Environmental Sciences. 22 (2014) 403–413. doi:10.1016/j.proenv.2014.11.038.

AUTHORS PROFILE

Ancy Breen W received her M.E Master degree in Computer Science and Engineering from the Sathyabhama University, Chennai, India in 2010. And she is a research scholar at Anna University, Chennai, Indian. Her research Area of Interest is Internet of Things, Edge Computing, Networks and Big data.

S.Muthu Vijaya Pandian is received his Doctoral degree from Anna University, Chennai, India in 2012. He has Published more than 20 International Journals. His Area of Interest is Power Systems, Electrical Machines and Internet of Things.

Praveen Talari received his M.Tech Master degree in Computer Science and Engineering from Jawaharlal Nehru Technological University Hyderabad, India in 2008. And he is a research scholar at Anna University, Chennai, India. His research interests are in the area of Data Mining, Machine Learning, Big data and Internet of Things.