IOSR Journal of Engineering (IOSRJEN) **www.iosrjen.org**
ISSN (e): 2250-3021, ISSN (p): 2278-8719
PP 60-64

An IOT Based Architecture For Power System Integration

Debswarup Rath[1], Balaji Prasad Padhi[2], Bijaya Kumar Mohapatra[3]
[1](EEE, Gandhi Institute for Education and Technology, Bhubaneswar, India)
[2](EEE, Gandhi Institute for Education and Technology, Bhubaneswar,India)
[3](EEE, Gandhi Institute for Education and Technology, Bhubaneswar,India)

Abstract: *A term is often used in electrical engineering is "The Internet of Things" (IoT). IoT was coined in 1999, and it refers to the growth of possibilities of machines and sensors in world communicating with each other in a "mobile, and instantaneous "way, making literally everything controllable from our phones to our streetlights to our refrigerators " Smart grid is one of the features of smart city model. It is energy consumption monitoring and management system. Smart grids are based on communication between the service provider and consumer. One of the main issues with today's out-dated grid is efficiency. The grid are overloaded during peak times or seasons. It is also possible to hack and take free electricity. By using smart grid consumer and owner get daily electricity consumption reading and owner can cut electricity supply remotely through internet if bill is not paid. The data collected from the smart meters should not be accessed by any unauthorized entities. In case meter tempering is happening then owner and consumer get message and then owner take the action accordingly. A circuit in customer's energy meter, from that energy consumption data can be acquired. The Acquired data is updated on cloud service, so that consumer and provider can access that data through internet. The main part of project is smart grid meter. LED in smart meter blinks 3200 times to measure one unit. Second feature of this project is one micro switch is fitted in meter. This is to prevent meter tempering. There is one hidden switching circuit in that, whenever any person try to open the meter switch will get popup and controller send the message to owner and consumer. Third feature of project is to control the meter, if bill is not paid by consumer then owner can stop the service. Acquiring of data needs human resources, we can save this critical resource by using smart grid application.*

I. Introduction

Internet of Things (IOT) is present in an environment of variety of things that through wireless and wired channels and unique addressing modes are able to interact with each other. This interaction leads to create new applications and achieve common goals. The goal of IOT is to enable things to be connected ideally using network and any service. Objects make themselves recognizable by enabling context related decisions. They can communicate information about themselves. They can access information that has been aggregated by other objects. They are components of complex services. Smart cities are complex environments, several areas of innovation meet. This leads to substantially improvised socioeconomic development and standard of life. The Smart Grid or the intelligent-Grid, could be seen as the largest instantiate of the IOT network. The whole power grid system, from the energy power plant generation to the final consumers, including transmission and distribution networks, will be filled with intelligence and two-way communication capabilities to monitor and control the power grid anywhere. At a fine granularity and a high accuracy and precision. For instance, smart houses, will be equipped with smart equipment. Power generators and electric transmission and distribution networks will be equipped with various sensors and actuators. The aim of the Smart Grid is to keep a real time balance between energy generation and consumed by customers. This can be achieved by allowing a fine monitoring and control over the power system, thanks to the huge number of the two-way communicating smart devices like smart meters, smart appliances, sensors, actuators, etc.. The IOT will give a smarter grid to enable more information and connectivity through out the infrastructure. Through the IOT, consumers, manufacturers and utilities will unravel new ways to manage devices and ultimately conserve resources and save money by using smart meters, smart plugs and connected appliances.

II. IOT and Smart Grids

A better approach to solve modern day energy management crisis. There are limitations on most of the energy resources on Earth, and we are beginning to better understand that. As such, we are learning to appreciate the value of more efficient ways to consume our energy resources and incorporate sustainable forms of energy into our lives. Smart grids are designed to accommodate these needs.

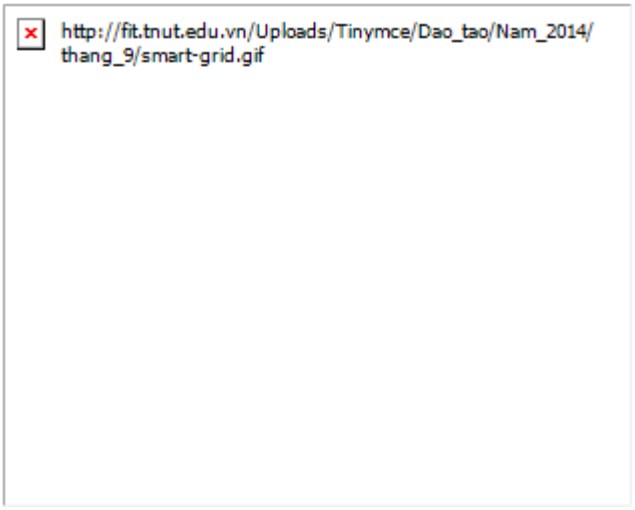

Fig-1-Smart grid representation [15]

There is increasing public awareness about the change in policy in energy sector. Future energy supply should no longer be based on fossil resources. Neither is nuclear energy a future proof option. In consequence future energy supply needs to be based largely on various renewable Fig 1. Focus must be on our energy consumption pattern and its volatile nature. This needs a system which should react instantly and give necessary control signals. This reaction is based on controlling generation and load by suitable configuration, based on IOT concepts. A smart grid is an energy system that moves from a centrally controlled system, to a decentralized and consumer oriented system to delivery of energy.

III. Problem Areas Identification

1. Avoid the power theft issues.
2. To stop meter tempering.
3. Real-time Models and design methods to describe working of different units
4. To reduce the human efforts and timely disconnection.

IV. IOT Based Efficient Power System Design (A CASE STUDY)

Cloud Computation is a new domain and need more research to offer a low barrier to entry for system administration, providing a Similarly research is going on for the advancement of iot and various products and services based on them, pertaining to one or more domains among those of Automation, Artificial Intelligence and Intelligent systems for energy conservation, Green Technology, and the likes.[14]

ZHOME [1]: It is a home automation Indian solution based on Z-Wave Home Automation technology which offers the best wireless solutions in terms of Security and Comfortability.

• Retrofit - Use existing switches, No Re-wiring
• Cost - 113 of solutions even from far east
• Complete - Integrates security, Lighting, AV Control and HV AC all in one 286
• Specialties - Home Automation, Lighting Controls, A V Automation, Building Management System
• Industry - Consumer Electronics

Z-Wave [2]: It is a wireless communication that helps you to talk to other devices wirelessly protocol.

• Long Distance control in residential and commercial environments
• Based upon low-power RF radio signals that are embedded into electronic devices and systems, such as music players, remote controls, RF watches and various other household appliances
. • has many applications in home automation
• Capabilities being demonstrated even in the roughest & most remote environments like from top of the Himalayas

ZHOME[14]: It allows customers to start small and expand on the go. They offer custom packages priced low especially for direct customers. They provide a starter kit to start experiencing your home automation today. The kits are classified based upon their user need as 3BHK, 4BHK and Villas. They have basic kits and premium kits where the latter provides more additional features other than security and lighting solutions like curtain

control,[14] A V integration and advanced security features with push notifications on iOS devices.
Basic Starter Kit
• 21 Lighting Control
• 1 Home Controller
• 1 WiFi Surveillance camera
• 1 Remote Controller with Scene Capability
• 2 Motion Sensors & 1 Door Sensor

ZHOME Plus (Premium Kit) [2] :
• 39 Lighting Control
• 1 Home Controller
• Premium touch screen with Aluminum flush mount
• 1 Remote Controller with Scene Capability
• 4 Motion sensors & 2 Door Sensors
• IP Camera for Video Door Phone
• 3 AC On/Off Control
• 2 Curtain Controllers

Villa Plus :
• 45 Lighting Control
• 2 Home Controllers
• Premium touch screen with Aluminum flush mount
• 1 Remote Controller with Scene Capability
• 5 Motion sensors & 3 Door Sensors
• IP Camera for Video Door Phone
• 1 A V Automation
• 6 AC On/Off Control
• 4 Curtain Controllers
• 1 Yale Door Lock with bio metrics

A V Room Automation:
• 6 Lighting controls
• 1 Handheld Remote
• A V & AC Control (1 Room)
Lighting controls adds intelligence and automation to your existing switches.[14] The opening of your doors and lights are controlled as per setting you choose. Based upon the outside luminescence it automates your balcony lights. The automatic opening of AC based upon your presence in room and the surrounding temperature.
ZHOME Dimmer & Switch combo devices allow you to convert your switches into special relay switches that provide intelligent automation to your home appliances and lights[14]. The Z-wave technology used can be extended to more rooms at larger distances with the help of Mesh network. So controlling of your lights and appliances not just to any one room but many rooms with one controller.

ZHOME Combo Switch 100-240V: It consists of 2 Relay electromagnetic based switches and 1 Dimming control in a single module chip. It allows adding intelligence to your existing lighting without and re-wiring. The intelligent system also takes care about the load types. It is the best solution to upgrade existing lighting controls with a very low cost module.
Features & Benefits:
• Compatibility with power consideration of switches in India providing a vast application design.
• Small in size that can fit behind wall boxes.
• All types of lighting loads including incandescent, halogen, electronic low voltage, fluorescent, compact fluorescent, magnetic low voltage and LEDs are sensed automatically
• Cut-off in your electricity bills and energy by using efficient lighting solutions.
• Mood lighting and event scenes are done with ease.
• Remembering of last power state at the time of power cuts
• Wireless Z Wave technology provides automation to long distances.

SYNCO LIVING 287: Synco Living [14] Home automation and control system provide comfort and superior energy efficiency through intelligent home automation. This system provides Convenient control and switching of HV AC systems, lights, blinds and more. This system boasts of providing a comfortable home where you

save energy costs every month, a pleasant oasis with a perfectly coordinated room climate, and the security of knowing that your home is always monitored even when you are not there.

Synco™ Living:the intelligent home automation system, turns your four walls into a secure and energy-efficient home. It is a reliable system that thinks along with you and controls many things in the background, including the room temperature and ventilation. Synco living controls your blinds, provides scene control functions, simulates your presence by turning lamps on and off, reports water damage and monitors doors and windows. In addition, a smart phone allows you to access the system at any time - from everywhere.

Synco living's benefits include energy efficient automation that reduces your energy consumption while making your living environment more comfortable. Many functions run automatically so you don't have to think about them or take action. Not only does this eliminate many daily tasks, you also benefit from the system's reliability - extremely accurate values, precise control and great dependability. All components and functions are based on Siemens' many years of experience in building automation.In addition to easy operation, a comfortable room climate, energy efficiency and security, Synco living also offers a high level of flexibility. For example, if you determine that other scenes would be more suitable, you can customize Synco Living to your new needs, either by programming new scenes or by reprogramming existing ones.Synco Living offers operator and display units for different needs. The spectrum ranges from simplest operation from within the room or on the road using a smart phone, operation from a central apartment unit to professional PC tools during commissioning.Salient features of Synco Living Home Automation System

• Less energy consumption and comfort ability by providing many home tasks (HV AC, lights and blinds)
• reduce up to 30% energy wastage and lower C02 emissions
• adding components are flexible

V. Advantages and Disadvantages

Advantages:

- Efficient transmission of electricity.
- Quicker restoration of electricity after power disturbances.
- Reduced operations and management costs for utilities,
- Tamper detection to reduce power theft.
- Safe and secure communication with elements of the network.

Disadvantages:

- Exposure of sensitive consumer data.
- Connectivity to untrustworthy partners.
- Exposure of critical infrastructure due to connectivity reasons.
- Introducing malicious software, compromised hardware could result in denial of service .
- Biggest concern is Privacy and Security as some types of meters can be hacked.

VI. Conclusion

IOT is an useful tool when it comes to its application in power system. The modern day analogue power system tools needs to undergo a radical change to accommodate this feature. Though small but various utilities have taken steps towards implementation of IOT based technologies like SCADA, Smart metering, Building Automation, Connected Public Lighting, Smart Grid etc. This is a matter of time when this technological change will start to give rich dividends.

References

[1]. ZHome: http://z-home.orgl
[2]. ZWave : http://www.z-wave.coml
[3]. SYNCO LIVING : https:/lhit.sbt.siemens.com
[4]. Rintala, Mikko, JussiSormunen, Petri Kuisma, and MattiRahkala. "Automation System Products and Research."(2014).
[5]. Sandeep Patel, Punit Gupta, Mayank Kumar Goyal, "Low Cost Hardware Design of a Web Server for Home Automation Systems", Conference on Advances in Communication and Control Systems(CAC2S), 2013
[6]. Golzar, M.G. ;AsanPardazan Co. ; Tajozzakerin, H.R., "A New Intelligent Remote Control System for Home Automation and Reduce Energy Consumption", MathematicaVAnalytical Modelling and Computer Simulation (AMS), 2010, IEEE.
[7]. Alkar, A.Z., HacettepeUniv; Roach, J. ;Baysal, D., "IP based home automation system", Consumer Electronics, IEEE Transactions on (Volume:56 ,Issue: 4), November 2010, IEEE [8] AI-Ali, A.R. ; Dept. of Comput. Eng., American Univ., United Arab Emirates ; AL-Rousan, M., "Java-based home automation system", Consumer Electronics, IEEE Transactions on (Volume:50 ,Issue: 2), May 2004, IEEE
[8]. Dr.OvidiuVermesan and Dr. Peter Friess,"Internet of Things Strategic Research and Innovation Agenda"in Internet of Things:Converging Technologies for Smart Environments and Integrated Ecosystems,River Publishers,Denmark,2013,pp.9-30.
[9]. Rajiv .K. Bhatia and VarshaBodade,"Smart Grid Security and Privacy: Challenges, Literature Survey and Issues",International Journal of Advanced Research in Computer Science and Software Engineering,Volume 4, Issue 1, January 2014.
[10]. StamatisKarnouskos,"The cooperative Internet of Things enabled Smart Grid",SAPResearch,Vincenz-PriessnitzStrasse 1, D-76131, Karlsruhe, Germany,2013.

[11]. David Chaves,AlexandrePellitero and Daniel Garcia,"ProvidingIoT Services in Smart Cities through Dynamic Augmented Reality Markers",sensors,ISSN1424- 8220,Published:3July2015
[12]. V. Dehalwar, R. K. Baghel, M. Kolhe. Multi-Agent based Public Key Infrastructure for Smart Grid, The 7th International Conference on Computer Science & Education (ICCSE 2012) July, 2012. Melbourne, Australia.
[13]. MitaliMahadevRaut, Ruchira Rajesh Sable, ShrutikaRajendraToraskar "Internet of Things(IOT) Based Smart Grid"International Journal of Engineering Trends and Technology (IJETT) – Volume 34 Number 1- April 2016
[14]. Anisha Gupta, Punit Gupta , JasmeetChhabra ,"loT based Power Efficient System Design using Automation for Classrooms"978-1-5090-0148-4/15/$31.00© 2015 IEEE Third International Conference on Image Information Processing
[15]. http://fit.tnut.edu.vn