DESIGNING ENERGY EFFICIENT FRAMEWORK FOR BUILDING USING INTERNET OF THINGS

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ABSTRACT

Smart energy is one of the important aspects in upcoming world. The usage of electricity is increasing day by day and so there occurs a major scarcity of electricity. In order to overcome this scarcity of electricity, it is mandatory to use it efficiently. This proposal is an attempt to save energy by using internet. Here the components are interconnected by means of internet so it is called internet of things (IoT). The energy efficiency of buildings plays a vital role for the environment and global sustainability. In a LEED-gold-certificated green office building the energy used are monitored, evaluated and analyzed, although they are green by design due to the centralized and static building controls, these buildings are not energy efficient. So an IoT framework is proposed with the use of smart location-based automated and network energy control. Here smart phone platform and IOT technologies are used to overcome this problem to use energy efficiently and the unwanted use of energy can be controlled.

Index Term— Internet of things (IoT), Energy Efficiency, Location network controls.

1. INTRODUCTION

Internet of Things (IoT) is an ideal emerging technology to influence the internet and communication technologies. Traditionally in the object oriented paradigm everything in the world is considered as an object, but in the IoT paradigm everything in the world is considered as a smart object, and allows them to communicate each other through the internet technologies either by physically or by virtually. IoT allows people and things to be connected anytime, anyplace, with anything. Let us consider a situation where we face this at most of the time. We often forget to switch off the electrical appliances such as light in the rooms and plugging off the charger without switching it off .It may be a little to one but when considering as the whole there definitely shows the tremendous difference. This difference result shows how electricity gets wasted. And Besides the resource from which the electricity is produced is also getting depleted. So we have no other way than using the resource efficiently. We measured the power consumption in products .The below table summarizes the measurement with average, minimum and maximum power level. The power consumptions are noted in Watts (W).

Electrical Device	Average used (W)	Min (W)	Max (W)	No .of Devices
Charger with mobile phone				
On, charged	2.29	0.86	5.55	4
On, charging	3.68	28	7.5	25
Power supply only	0.26	0.02	2.0	33
Computer with desktop				
On	74	29	181	64
Off	2.84	1.0	9.21	66
Sleep	21.13	1.1	83.3	54
Modem with cable				
Off	4.04	2.01	6.62	9
On	7.25	4.65	9.02	18
Standby	4.83	4.05	5.01	4

2. PROBLEM STATEMENT

Green buildings are not energy efficient, in green office building the energy used are monitored, evaluated and analyzed, although they are green by design due to the centralized and static building controls, these buildings are not energy efficient. There occurs more number of scenarios where the electricity power gets wasted. Some of them are, consider a home where family members are, while they leave home in hurry they forget to switch off motor, until then they return both electricity and water gets wasted, sometimes they unplugs their mobile phones from charger just without switching off the power supply. This is an attempt to save energy, although we are unable to save power wasting by means of copper loss, we can save electricity by avoiding unwanted usage. Due to the advent of new technologies, devices, and communication means like social networking sites, the amount of data produced by mankind is growing rapidly every year. The amount of data produced by us from the beginning of time till 2003 was 5 billion gigabytes. If you pile up the data in the form of disks it may fill an entire football field. The same amount was created in every two days in 2011, and in every ten minutes in 2013. This rate is still growing enormously. Though all this information produced is meaningful and can be useful when processed, it is being neglected.

3. EXISTING SYSTEM

The existing system has drawbacks. The given below provides solutions for the problems faced in the organization. Develop Green Building Concept: Improve energy efficiency by integrating old and new equipment in the building to achieve significant energy savings. Build Intelligent Gateway Solution: Utilize Intel® Quark™ SoC X1000 to develop an intelligent, automatically controlled framework that provides low-power, high-performance computing for connecting legacy and new systems while enabling seamless and secure data flow between edge devices and the cloud. Due to the centralized and static building controls, the actual running of green buildings may not be energy efficient even though they may be "green" by design.

Smart Location-Based Automated Energy

In this project present our smart location-based auto-mated energy control IoT framework. This section is mostly based on our contributions.

Structure of Our Design with Components and Their Interaction

Overall Structure

There are multiple design components and aspects which interact with each other and form a complete framework of our idea to fulfil the goals. We envision an occupant-oriented and involved networked system and depict it .The key design components include: mobile devices-based distributed energy monitoring and remote control, location application on smart phone, multisource energy-saving policies and strategies, cloud-computing platform-based data storage and application, and energy data modelling and strategy formation. We discuss these below.

Smart Mobile IoT Devices as Remote Controls

In the last several years, smart mobile devices have become very popular. Smart phones generally have multiple networking interfaces such as 3G, wireless fidelity (WiFi), worldwide interoperability for microwave access (WiMAX), Bluetooth, and have multiple sensors including global positioning system (GPS) sensors. Because of various connectivity provisions and global accessibility to the Internet, they are suitable for use in any system that needs humans' online participation or interaction trend makes the cost even lower and the sensors are connected to the Internet at all time. Smart phones are ideal for monitoring, controlling, and man aging the energy control systems remotely from anywhere at any time. After appropriate authentication and authorization, the occupants are allowed to modify and change their energy saving policies online by interacting with the policy servers of their office and residential buildings. Such design allows dynamic changes to the energy-saving policies and offers better flexibility to the occupants. It can be a good complement to the general policy decision process based on the modelling results. Such an "app" can be easily developed for the smart phone based on the web technology.

Multisource Energy-Saving Policies Hierarchy

In a real environment, various parts of an organization, such as campus, building, department, and labs, may be in charge of different components of a building. Each of these may have their own policies and requirements that need to be taken care of in controlling the energy consumption. Even in a single home building, locations of multiple family members and they satisfies the user's preferences for energy saving and comfort. An "App" on the device can automatically enforce these desired policies.

With the help of the location-aware mobile devices, these dynamic adjustment policies could also enable the cooperation and interaction among different buildings. For example, when the location detection daemon on the user's smart phone detects that the user has moved out of a threshold distance range from his/her home building and is moving into a threshold distance range of his/her office building, then a message is sent to a centralized server to trigger the policy control process. The office building room owned by the user will start preheating /cooling to prepare a user-customized or optimized working environment, while the message also triggers the home building to transit into an energy-saving mode.

They need to be able to deliver every single watt of power to every single customer at any given moment of the day. If they

fall short, the whole system could crash. When you turn on a light or start your dishwasher, you're probably not thinking about how many other people are making demands on the system at the same moment. But your electric utility would like you to. Because if you don't that could mean they need to build another power plant to increase their capacity. And power plants are very expensive. So they charge a fee for demand, which in states like New York and California, can amount to as much as 40 percent of the entire electric bill or more. This is done both to incentivize limit-setting . Offering a modular, flexible design, Samsung SDI's Energy Storage System (ESS) technology can be easily tailored to meet a diverse set of customer demands and provide a turnkey solution for every player along the electricity value chain. The lithium ion cells used in Samsung SDI's ESS were developed to meet the demanding requirements of global top automotive brands' electric vehicles. Thus, Samsung SDI ESS provides long life span, safety and the highest dynamic charge acceptance, promising a low total cost of ownership and reliability.

Under the world's class quality assurance measures, Samsung SDI manufactures modules, trays, and rack systems to meet all spectrums of consumer requirements. Computation-intense modelling and analysis jobs are mostly done in the cloud. The communication layer provides configurability, reliability, and security for the network communication between the cloud and the client. The reason we incorporate this layer in our design is that it can alleviate the overhead to develop the cloud application and accelerate our application development and deployment process. It also becomes much easier to integrate other services using the same platform (such as authentication services, email services, and user interfaces) to the application on demand and make the development of a cloud application a less-complicated task. The top layer is the application layer. We are researching and developing a user friendly prototype web-based user interface and application for preferences need to be considered.

Therefore, in our location based automatic control scheme, we add policies coming from these levels of control hierarchy. There may be a tree-like structure for the building control plane in which there are policy servers enforcing the energy-saving policies covering different levels. This also applies to the residential buildings in which the tree structure may be relatively simple. The mobile users can be connected to the Internet through smart phone, tablet, or even laptop with WiFi connections. For example, the smart phone holder leaves the home building and travels toward his/her building. The movement and location changes will trigger the policy servers to adjust the energy-saving policies for both buildings accordingly. we have experimented with several policy-based control schemes. We apply similar ideas to the building and community environments. In particular, each control region can be defined as which is managed by a realm manager (also a policy server in our building testbed). Energy control policies may span multiple realms and sometime conflicts may have to be resolved.

Mobile Device Location-Based Automatic Control

Almost all phones can determine their location by referring to signal strengths from various transmission towers. New generations of smart phones can provide localization much more precisely with embedded GPS chips. We use this location information in designing automatic control policies that can turn ON/OFF energy-consuming devices at home or office depending upon the location and direction of movement of the user. By doing so, a dynamic and flexible policy can be applied which satisfies the user's preferences for energy saving and comfort. An "App" on the device can automatically enforce these desired policies. With the help of the location-aware mobile devices, these dynamic adjustment policies could also enable the cooperation and interaction among different buildings. For example, when the location detection daemon on the user's smart phone detects that the user has moved out of a threshold distance range from his/her home building and is moving into a threshold distance range of his/her office building, then a message is sent to a centralized server to trigger the policy control process. The office building room owned by the user will start preheating /cooling to prepare a user-customized or optimized working environment, while the message also triggers the home building to transit into an energy-saving mode.

It provides the basic data storage and retrieval service for the logged building energy consumption data. Computation-intense modelling and analysis jobs are mostly done in the cloud. The communication layer provides configurability, reliability, and security for the network communication between the cloud and the client. The middle layer is for cloud application development using the open API provided by the cloud providers such as Google App Engine. The reason we incorporate this layer in our design is that it can alleviate the overhead to develop the cloud application and accelerate our application development and deployment process. It also becomes much easier to integrate other services using the same platform (such as authentication services, email services, and user interfaces) to the application on demand and make the development of a cloud application a less-complicated task. The top layer is the application layer. We are researching and developing a user friendly prototype web-based user interface and application for the building environment, which can be easily configured and managed by the remote client

Example: dynamic multisource energy-saving policy adjustment by the mobile devices.

4. PROPOSED SYSTEM

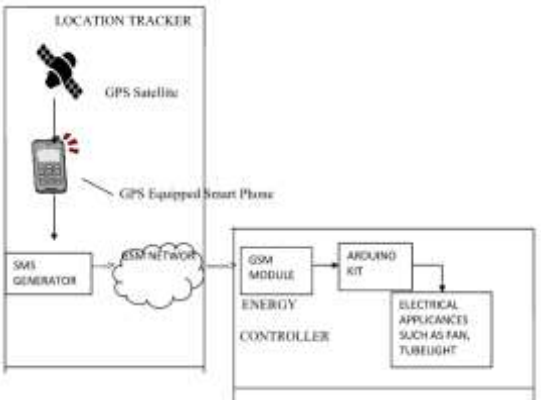
This project results in saving energy in buildings. This project has the experimental result that can be seen directly. It Deals with saving energy in buildings. Energy is the important aspect in current environment. There exist several methods to save energy; here also energy is saved by using Internet Of Things. Saving energy means decreasing the amount of energy used while achieving a similar outcome of end use. Using less energy has lots of benefits – you can save money and help the environment. Generating energy requires precious natural resources, for instance coal, oil or gas. Therefore, using less energy helps us to preserve these resources and make them last longer in the future.

Saving energy in homes can be done in several methods. There exist many scenarios where the power gets wasted to a greater extend. The wastage of electricity includes scenarios such as, when the user is in hurry then he will not consider about the switched on fans, lights, etc., this proposal is made to take care of electricity in these areas. The proposed system is designed to consider the kind of scenarios and to control power losses in buildings. When this user's move out from their houses and a certain distance apart, the GPS system provided with the smart phones will automatically generate message and that ask the user either to switch on or off the lights.

For this purpose this concept uses arduino kit, that is positioned in the home location. The generated message will reach the home placed arduino kit and the respective electronic gadget will get switched off. This is connected to only some gadget like fans, lights and these are not suitable for connecting with gadgets like refrigerator, washing machines. The gadgets that are meant to switch off during the absence of the user will be connected to this kit that is to be switched off during the user's absence.

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board. The Arduino platform has become quite popular with people just starting out with electronics, and for good reason. Unlike most previous programmable circuit boards, the Arduino does not need a separate piece of hardware (called a programmer) in order to load new code onto the board – you can simply use a USB cable. Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program. Finally, Arduino provides a standard form factor that breaks out the functions of the micro-controller into a more accessible package.

Proposed method synthesizes the previous separate contributions into a complete IoT framework design. It includes research and work in the whole process of identifying the key problems, finding methods to solve them, and developing prototype system to prove the effectiveness of the proposed method. Then build a novel experimental prototype IoT system, which demonstrates the real-time location-based automated energy policy control across multiple buildings. It is the basic step in changing from the current centralized control and static energy consumption modes to distributed and dynamic energy control in the consumer-side smart grids containing various common buildings.. The central idea is developed to generalize the smart phone and location-based energy control idea and include policies of multiple levels of organizations. It aggregates the energy saving of individual users and allows distributed and dynamic energy control, which is the key for energy proportionality.



Architecture diagram

5. CONCLUSION

Here we proposed a framework, for the efficient usage of electricity in buildings by using the concept of IOT. By means of IOT we connect our smart phones and our home location for the effective saving of energy. By using this proposal a large amount of electricity can be saved and can make our home as a energy efficient building. This concept is not suitable for preventing copper losses but can prevent energy wastage to a greater extend in buildings. This concept will be more useful in today busy world and will be suitable. This project mainly concentrates on saving energy in specified areas. In that area too, only from specified gadgets that are not in necessary during the user is not available in that area. This project also has the disadvantage that it will not support the mechanism of saving energy in the area of copper losses. This can be enhanced in future to support wastage of energy by copper loss. This concept mainly deals in saving energy and making our world to evolve efficiently. By this way of saving energy will help our future generation. So this can be enhanced to make our world to evolve efficiently. So our future enhancement is to save energy in the area of copper losses also. Thereby, a large amount of electricity will be saved in upcoming future.

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