International Journal of Innovative Research in Science and Engineering
Volume 08, Issue 03, 2022
www.ijirse.com
ISSN: 2454-9665

Smart Building as Internet of Things Application

Ms. Varsha Khare[1], Dr. Sumit Bhattacharjee[2], Dr. Viddhulata Mohite[3]

bsumit021@gmail.com

[1] Research Scholar, [2] Research Guide, [3] Research Co – Guide

Singhania University, Pacheri Bari, Rajasthan, India

Abstract:

Internet of Things (IOT) is an important step towards future. Internet of Things is where "things" communicate with each other without the human intervention. It is achieved by providing enough intelligence to "things" with the help of devices like sensors, cameras, RFID and smart phones etc. IoT can be helpful in connecting wide range of objects as large as a building or a car to objects as small as tea kettle or a tea cup. Wireless sensor networks (WSN) are well suited for long-term monitoring and data acquisition for IoT representation. The application requirements for low cost, high number of sensors, fast deployment, long lifetime, low maintenance, and high quality of service are considered in the specification and design of the platform and of all its components. Reduction of energy consumption and pollution became a common goal of many countries. This paper discusses an innovative methodology for smart building to reduce energy consumption.

Keywords: Internet of Things, Wireless Sensor Network, RFID, Data acquisition

I. INTRODUCTION

In view of increasing pollution and its effect, many organizations are working towards the goal of reducing energy consumption and CO_2 emission to reduce the global warming. Many countries are providing incentives to promote the low-carbon and sustainable technologies, especially in the building sector. In Europe, this sector is responsible of 40% of total energy consumption and 36% of total pollution [1]. To achieve this, there is a strong need to realize tools of modeling, monitoring and controlling the building energy behaviours, Information and Communication Technologies (ICTs) and Machine Learning techniques.

Buildings account for about 40 percent of total energy consumption worldwide. They also contribute a high percentage to overallcarbonemissions.The government of India has launched a scheme to develop 100 Smart Cities. Infrastructure, transport, energy, utilities, environmental sustainability, and communication are targeted to enable Smart City project.

ISSN: 2454-9665

Energy efficiency in buildings is very critical, and the objectives of a "smart building" is to monitor, reduce and manage building energy consumption but it should not be done by compromising the occupant comfort and operational efficiency. Heating, Ventilation and Air Conditioning (HVAC) systems contribute to significant energy consumption. Energy is consumed by lighting and plug loads also. Smart buildings employ different types of IoT sensors in HVAC and other systems to make the overall system more intelligent and adaptive. In this process, huge amount of data will be generated.

II. RESEARCH BACKGROUND

Commercial buildings have requirement of monitoring, management, and resource optimization. These requirements are energy management,video surveillance, environmental monitoring and fire detection [2], [3], [4].Few years back, IoT was not largely implemented since it had security issues but now technical advancements allow IoT to enter in the building industryAccording to reports by Ericsson, the number of interconnected objects will grow over 50 billion soon.IoT enables human life and work in a noteworthy way which includes automation, transportation, health-care and disaster management. IoT enables an object to listen, hear, see and communicate at the same time. IoT transforms the devices from being smart to influence and

revolutionize human life.Smart buildings integrate information from different sensors, embedded devices and sources for intelligence, control, materials and construction for entire building system.

Many systems have been designed using zigbee modules, Bluetooth modules, sensors and GSM modules. Very soon internet will not be considered as network of computers, it will rather be considered as billions of smart objects along with embedded devices. Hence, the application of Internet of Things (IoT) will exponentially rise both in scope and size, providing new opportunities as well as challenges.

III. PROPOSED ARCHITECTURE

Buildings are not originally designed with required capabilities to integrate sensing, storage, network, processing, and computing capabilities into home appliances, door, window, lights, smoke detectors, etc, which makes the process very crucial. Refrigeration, Ventilation,

ISSN: 2454-9665

Heating and Air Conditioning (HVAC) systems within buildings contribute to significant energy consumption. Integration of various sensors with the building using internet makes the system energy efficient.

Figure shows the schematic diagram of the proposed system. Buildings are equipped with Wireless Sensor Network (WSN) with to monitor indoor temperature and air humidity in rooms [2].

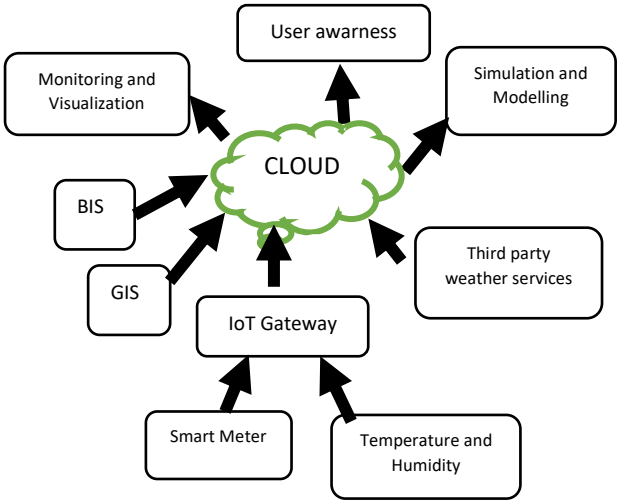

Fig: Schematic diagram [2]

It has a smart-meter that monitors electricity consumption. Both WSN and smart meters are connected to a gateway that sends data to the Cloud. Proposed system has simulation and modelling of building energy performance, building status monitoring and visualization of collected data and user awareness.

Every 20 minutes room temperature and humidity will be sent and accordingly decision is taken [3]. It is iterative and increases energy efficiency. Other sensors like PIR sensor, gas sensors, ultrasonic sensor, earthquake sensor, water level sensor can be integrated for better performance.

IV. APPLICATION

Increased IoT adoption implies more detailed and real-time monitoring of all devices which consume energy in a building and ensures better connectivity with the smart grids [4]. IoT proposes many applications other than smart home or building. Some of the applications are:

ISSN: 2454-9665

- Physical security
- Vehicular monitoring
- e-health
- Waste water management system
- Environmental monitoring
- Smart garden
- Water level for lakes, streams, sewages
- Anti-theft system
- To detect intrusions in dark places

V. CONCLUSION

The development of recent technologies such as Internet of Things have opened new avenues for smart home and cities. The idea of IoT is to connect individual, system and the environment together. Proposed intelligent system to be integrated with buildings saves energy and cost. It also makes life easy. Appropriate sensors aid to security of the building and its residents.

REFERENCES

[1] "Building Energy Management System: An Application to Heating, Ventilation, Lighting and Occupant Satisfaction", G. Levermore, Taylor& Francis, 2002

[2] "Building energy modelling and monitoring by integration of IoT devices and Building Information Models" Bottaccioli, Lorenzo; Aliberti, Alessandro; Ugliotti, FRANCESCA MARIA; Osello, Anna; Macii, Enrico; Patti, Edoardo; Acquaviva, Andrea. - 01(2017), pp. 914-922. ((Interventopresentato al convegno 41st IEEE Annual Computer Software and Applications Conference (COMPSAC 2017) tenutosi a Torino, Italy nel 4-8 July 2017

[3] Indoor Air-Temperature Forecast for Energy-Efficient Management in Smart Buildings / Aliberti, Alessandro; Ugliotti, FRANCESCA MARIA; Bottaccioli, Lorenzo; Cirrincione, Giansalvo; Osello, Anna; Macii, Enrico; Patti, Edoardo; Acquaviva, Andrea. - (2018), pp. 1-6. ((Interventopresentato al convegno 18th IEEE International Conference on Environment and Electrical Engineering (EEEIC) tenutosi a Palermo, Italy nel 12-15 June 2018 [10.1109/EEEIC.2018.8494382].

[4] Internet of Things: State-of-the-art, Challenges, Applications, and Open Issues Hany F. Atlam1,2*, Robert J. Walters1 , Gary B. Wills1 1University of Southampton, Southampton, 2Menoufia University, Menoufia, Egypt IJICR, Volume 9, Issue 3, September 2018

ISSN: 2454-9665

[5] Ming Wang, Guiqing Zhang, Chenghui Zhang, Jianbin Zhang and Chengdong Li, "An IoT – based Appliance Control System for Smart Homes", 2013 Fourth International Conference on Intelligent Control and Information Processing (ICICIP)June9–11,2013,Beijing, China

[6] Freddy K Santoso and Nicholas C H Vun, "SecuringIoT for Smart Home System", 2015 IEEE InternationalSymposium on Consumer Electronics (ISCE).

[7] A. Corna, L. Fontana, A. A. Nacci, D. Sciuto, "Occupancy Detection via iBeacon on Android Devices For Smart Building Management", Proceeding of DATE '15 Proceedings of the 2015 Design, Automation & Test in EuropeConference& Exhibition, Grenoble, France — March 09 - 13, 2015, Pages 629-632, ISBN: 978-3-9815370-4-8.

[8] A. Al-Fuqaha, M. Guizani, M. Mohammadi, M. Aledhari, M. Ayyash, Internet of things: a survey on enabling technologies, protocols, and applications, IEEE Commun. Surv. Tutorials 17 (4) (2015) 2347–2376, https://doi.org/10.1109/COMST.2015.2444095.

[9] J. Lin, W. Yu, N. Zhang, X. Yang, H. Zhang, W. Zhao, A survey on internet of things: architecture, enabling technologies, security and privacy, and applications, IEEE Internet of Things J. 4 (5) (2017) 1125–1142, https://doi.org/10.1109/JIOT.2017.2683200.

[10] A.J. Trappey, C.V. Trappey, U.H. Govindarajan, A.C. Chuang, J.J. Sun, A review of essential standards and patent landscapes for the internet of things: a key enabler for industry 4.0, Adv. Eng. Inform. 33 (2017) 208–229, https://doi.org/10.1016/j.aei.2016.11.007.