

# Creating the Smart Campus by Internet-of-Things

Mala B M<sup>1</sup>, Mamatha G<sup>2</sup>, Nandini S<sup>3</sup>, Chithra Apoorva D A<sup>4</sup>

<sup>1</sup> Assistant Professor, <sup>2</sup> Student, <sup>3</sup> Assistant Professor, <sup>4</sup> Assistant Professor,  
Dept of CS & E, GITAM School of Technology, Bangalore.

**Abstract:** This paper describes the development of smart campus using Internet of Things technology. Through smart campus, it is possible that a campus is connected via online by the outside entity, so that the teaching approach based on technology can be conducted in real time. This research was conducted in smart education (eLearning, Personalized Learning, Virtual Classroom), smart parking (a parking system that provides the information about available parking lot and the information that the parking lot has been full) and smart room (system that provides information related to the classroom that is being used or vacant). The main aim is to design of smart campus system that includes smart education development, smart parking and smart room.

**Key terms:** smart education, smart parking, smart room.

## 1 INTRODUCTION

In the advanced nations, Information and Communication Technology (ICT) has been used to increase the quality of higher education. ICT is used to fix and increase the quality of learning process, research, library, information services and university management. One of the ICT implementations is the using of internet technology that is integrated to all of things of daily life that is called as Internet of Things (IoT). IoT is a structure in which objects, people are provided with exclusive identity and the ability to relocate data over a network without requiring two-way handshaking between human-to-human or human-to-computer interaction [1].

IoT technology has been widely used for the development of smart home, smart campus, smart building and smart city. Smart campus is a trendy application in the paradigm of the IoT. The concept of constructing a smart campus implies that the institution will adopt advanced ICTs to automatically monitor and control every facility on campus [2].

The design and the implementation of smart campus is different with others, depends on the campus needs. The infrastructures to build a smart campus are costly. However, when it is implemented, all the campus activities will be effective and efficient. To build a smart campus, it needs to build the digital infrastructure inside campus that can give services so that it will be beneficial for surrounding citizens. IoT which bases on the internet uses a variety of information sensing identification device and information processing equipment, such as RFID, GPS, GIS, JIT, EDI and other devices to combine with the internet to form an extensive network in order to achieve information and intelligence for entity [3].

## 2 LITERATURE REVIEW

The study by paper [4] proposes the solution of RFID design structure integrated by using modern technology from cloud computation, supported by good quality technology and economy. This technology supports things to increase the campus security, asset track record, valuable things, student record, security of paper exam and original certificate. The future class appears to increase pedagogy, in which the students can participate more in the learning process through interaction and collaboration. To make environment that supports future classroom, it needs integrated mechanism of any related things being needed.

In this research, the design of structure of Internet of Things was built, in which application domain is being made as system unity related to the internet [5]. To fasten and develop Intelligent Campus Internet of Things (ICIoT) more efficiently, the approach based on the runtime model to manage campus was applied as the result of the use of Wireless Sensor Network (WSN). It is hoped that all of management job description can be conducted by executing program that the model has been made appropriate.

In the learning part, experiment was conducted and compared by using the traditional method. This method can increase the management effectiveness of campus facilities, save energy as much as 16,7% [6]. In the study conducted by [7], the concept of internet based parking guide by using QR code was introduced. This system runs on cellular platform by visualizing the available parking lot for the customers so that they can make order.

## 3 SMART CAMPUS INFRASTRUCTURE

Smart Campus is one of the innovations that will be developed. Adopted from the existing smart city system, one of aspects that being considered in developing smart campus is the infrastructure. The infrastructure is the main key of the campus smart program. If the infrastructure has been well developed, the information related to the campus can be accessed from mobile phone or others gadgets.

Some parameters of the smart campus that being adapted for smart city are:

- Smart education consists of: eLearning, Personalized Learning, Virtual Classroom.
- Smart parking, a parking system that provides the information about available parking lot and the information that the parking lot has been full.
- Smart room, system that provides information related to the classroom that is being used or vacant.

## 4 SYSTEM DESIGN

The system design of smart campus which described in Figure 4.1 below limited on

- Smart education
- Smart parking,
- Smart room

Several factors are driving investigators to study smart campus including: deliver high quality services, protect the environment, and save cost. In this study, not only we explore the research conducted in this area, but we also investigate challenges and provide possible research opportunity regarding smart campus.

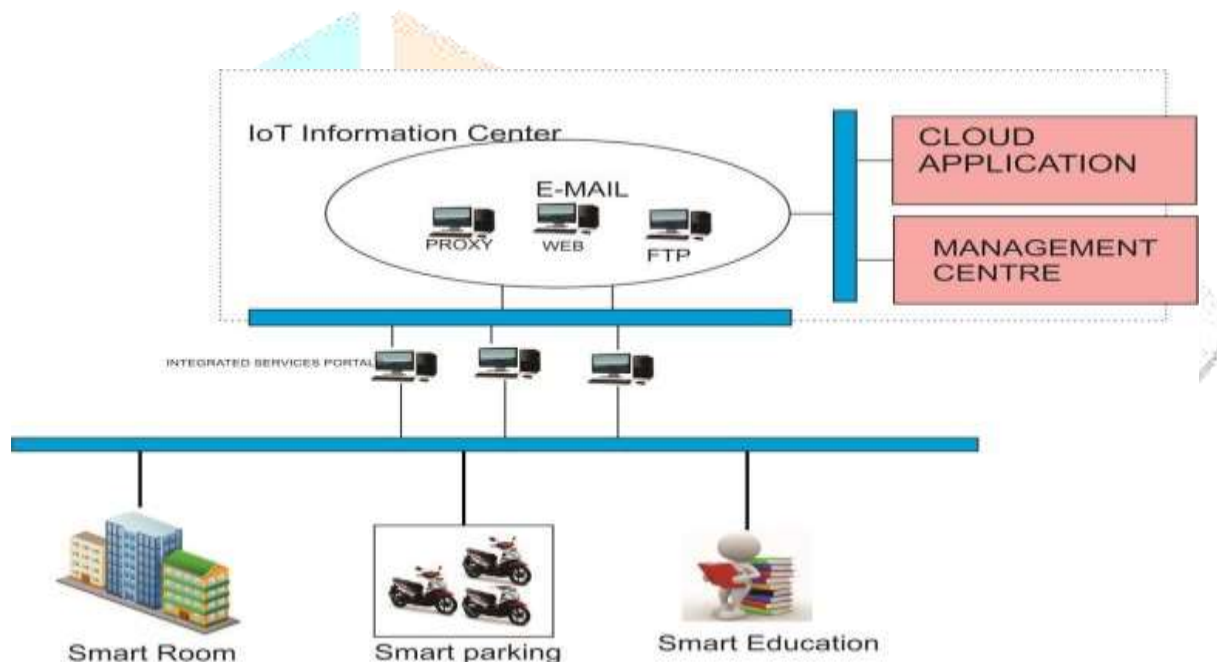


Figure 4.1: General scheme of system design

### 4.1 Smart education

In smart campus sector, the learning process is conducted through e-Learning system, which makes it possible for students to be able to join learning from anywhere, anytime with the internet connection. E-learning with video conference facility so that it is possible for students to face the teacher from different place. Besides, virtual class feature can help simulation for students to solve problem in learning. Virtual class can be used for practicum lessons.

### 4.2 Smart parking

A parking system that provides information related to the available parking lot, and also provides information when the parking lot is full. Sensor is put in the parking lot to scan the vehicle that enters the parking lot. The total amount of the vehicles that in the parking lot are revealed on the board. Next, the information will be processed by the system that provides information to the users about the available parking lot. The scheme is as described in Figure 2 below.

Internet of Things (IOT) plays a vital role in connecting the surrounding environmental things to the network and made easy to access those un-internet things from any remote location. It's inevitable for the people to update with the growing technology. And generally people are facing problems on parking vehicles in parking slots in a city. In this study design a Smart Parking System (SPS) which enables the user to

find the nearest parking area and gives availability of parking slots in that respective parking area. And it mainly focus on reducing the time in finding the parking lots and also it avoids the unnecessary travelling through filled parking lots in a parking area. Thus it reduces the fuel consumption which in turn reduces carbon footprints in an atmosphere.

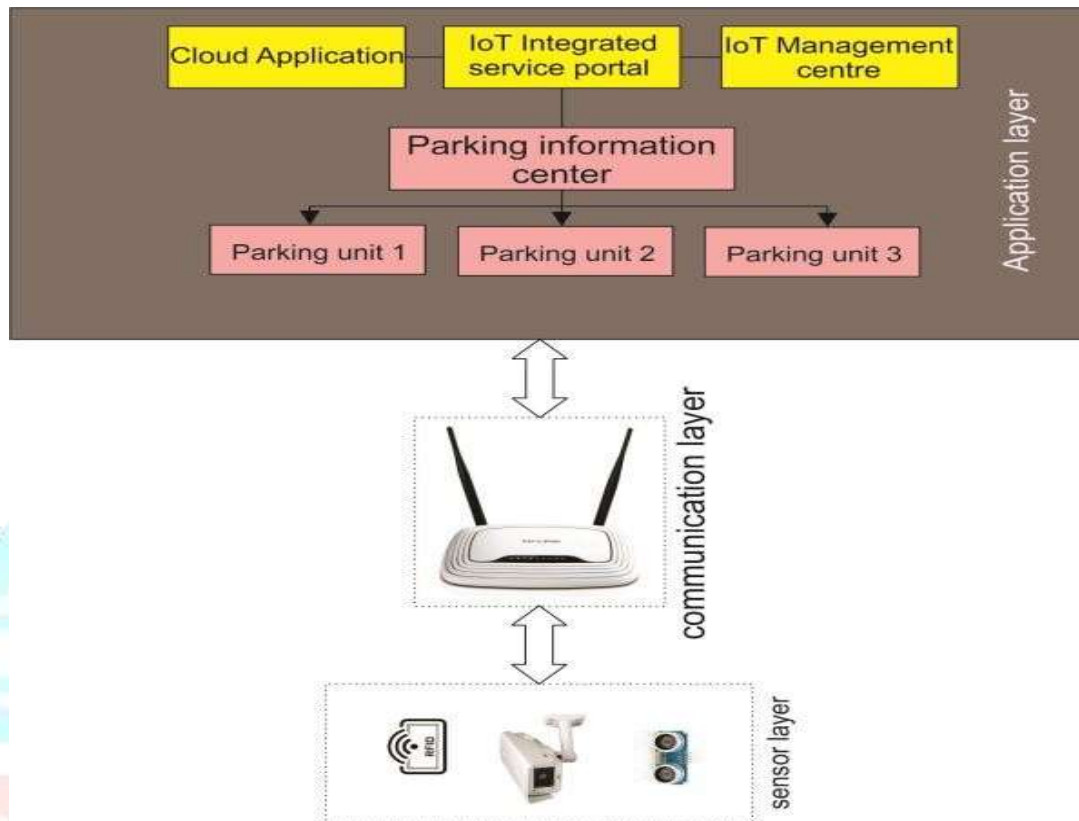


Figure 4.2: The scheme of smart parking

### 4.3 Smart Room

It uses the sensor of PIR, RFID, and camera. The concept of smart room is giving information about the vacant room, and the amount of the students being present on it. The data about amount and the name of the students are saved on the database. In this system, the students use RFID, so that the data of the students are in database. Smart system is being used in smart room. By using the sensor of PIR, the lights will be off automatically if there is no human in the room. On the other hand, the lights will be automatically on if there is or there are people in it.

## 5. CONCLUSION

IoT technology can be developed in any field. One of which is in the development of smart campus. Smart campus is an emerging and challenging concept for the technology to bring it in reality. The design of the system has created a scheme for implementation of smart campus limited on smart education, smart parking and smart room. This paper described the study of the concept that can be helpful in building the smart campus. The result of this research is the design of smart campus system that includes smart education development, smart parking and smart room.

## REFERENCES

- [1] Burange, A.W, Misalkar, H.D. 2015. Review of Internet of Things in Development of Smart Cities with Data Management & Privacy. International Conference on Advances in Computer Engineering and Application (ICACEA). IEEE.
- [2] Wang, H. 2013. Toward a Green Campus with the Internet of Things – the Application of Lab Management. Proceedings of the World Congress on Engineering 2013 Vol II.
- [3] Fan, P., Zhou, G. 2011. Analysis of The Business Model Innovation of the Technology of Internet of Things in Postal

Logistics. IEEE : 978-1-61284-449-7 page 532 – 536.

- [4] Mirza, Z.R., Brohi M.N. 2013. An In-Depth Analysis On Integrating Campus Radio Frequency Identification System On Clouds For Enhancing Security. Journal of Computer Science, Vol. 9, No. 12, hh. 1710-1714.
- [5] Chang, F.C., Chen D.K. 2015. Future Classroom with the Internet of Things A Service-Oriented Framework. Journal of Information Hiding and Multimedia Signal Processing, Vol. 6, No. 5.
- [6] Zhang, P., Wang, J. 2015. Management of Intelligent Campus Wireless Sensor Networks Based on Runtime Model. Journal of Computer and Communications, Vol. 3, hh. 22-31.
- [7] Shinde Smita N. Et al. 2015. An Android Application for Parking Management and Dissemination System. International Journal of Advanced Research in Computer Engineering & Technology, Vol. 4, No. 3.

