



SURVEY ON INTEROPERABILITY ISSUES IN DEVELOPMENT OF SMART HOMES

Renu Sharma
Asst. Prof. D.A.V. College
Amritsar, Punjab, India

Abstract : Smart Home is based upon having various IoT (Internet of Things) enabled devices to provide ease in modern living. IoT means to connect diverse devices with internet. Association with internet provides flexibility to operate or communicate or control devices from anywhere. Communication among diverse devices arises many challenges. In this paper interoperability issues are discussed regarding adoption of IoT devices in smart homes.

Keywords: IoT, Smart Home, ZigBee, Z-wave

I. INTRODUCTION

Smart Home is equipped with various IoT based devices to enable to monitor and control a home remotely. Internet of things or IoT means we are having devices connected to internet to share their information and to produce results useful for mankind. Future of computing will not depend on desktops but will be of IoT devices.[1]. IoT is most important electronic revolution after internet[2]. Even gartner report(2014) states that this going to have major expansion. If we check at area of applications of IoT, list is quite long but some of them are:

- Home Automation
- Health care monitoring
- Smart cities
- Education
- Transport
- Business
- Energy
- Disaster detection etc.....

II. MAIN COMPONENTS OF IOT

IOT is primarily based on:[3]

- Sensors
- Middleware
- Cloud computing
- Internet

Sensors: They are used to sense certain condition. Constraints of sensors are they are having low energy, constrained computation and low memory. Due to these constraints designing a system is difficult.

Middleware: in IOT environment all devices have different architecture to make communication possible, we need softwares.

They are responsible to integrate various devices.

Cloud computing : To make an IoT based application we need a cloud because sensors has constrained computation power and to make the computation possible we need

processing power which is being used of a cloud.

Internet: to connect various sensors and cloud we need Internet. Sensors are also power constrained so it is not feasible to have sensors all time on internet. So based upon particular application PAN can be used. And connection with the internet can be given for shorter time duration.

III. BENEFITS OF USING SMART HOME TECHNOLOGIES

By using smart home technologies primarily it is to increase luxury. But with passage of time it has included many benefits like.

1. Remote monitoring
2. Assisted living for elderly. [7]
3. Energy efficiency [8]
4. Comfort etc.

IV. CHALLENGES IN DEVELOPMENT OF IOT

In development of IoT many challenges are there. Some of them are:[4]

- Interoperability and integration
- Security
- Privacy
- Data storage
- Constrained resources

Interoperability and integration: IoT is primarily based upon sensors. Sensors do have different architectures. To combine them and to integrate them is biggest challenge. In IoT industry is lacking in standardization or we can say there are so many standards available. Every company is following different domains of standards. When these devices are to be integrated then many technological issues got arise. So there is a need of one standard model for development of IoT devices. So integration of any new device will be easy. For example if we have employed an home automation system and we have to replace an A.C. due to lack of unique standardization it might be possible to update our home automation system.

Security: security is the main challenge for IoT devices. As in BMW cars they found major possibility of intrusion using server of the company. IoT is based upon network and network is vulnerable to threats. As in home automation system main identity of user is RFID card. Copy of that card is possible. As in the recent case in USA alarm of missile attack falsely altered and it has created major havoc in the city. If a person is using GPRS all its travelling pattern can be monitored and that can create major security issues. If we study health monitoring, intruder can create major blunders. So in all sensitive areas IoT is quite helpful but its implementation is really important to be focused on security.

Privacy: privacy is also major concern. Somebody can study all patterns of anyone just by analyzing data of sensors. And that information can be used for criminal activities. GPRS, FITBIT[5] and other sensors used for home can easily tell about daily routine of somebody. So privacy is also one of the major issues in implementation of IoT.

Data Storage: in any smart environment huge data is produced. To process that huge data traditional data processing techniques cannot be used or we can say they are not capable enough to process that huge data. To overcome this challenge we need data processing techniques capable to work on high volume and high velocity data. Data mining tools are to be updated.

Constrained resources : in IoT devices major components are sensors. These sensors are really constrained as far as processing power, battery life and memory is concerned. To overcome these constraints are also a big challenge.

V. INTEROPERABILITY AND INTEGRATION

The main cost involved in developing smart home is to integrate various IoT devices[6]. IoT devices are based upon various protocols like

1. Zigbee
2. Z-Wave
3. X10
4. Insteon

All these protocols are having different architectures. And interoperability feature of the above protocols can be summarized as:

- Zigbee is not interoperable with other protocols.
- Z-wave is interoperable only with Z-wave based Devices.
- X10 is interoperable with Insteon and X10.
- Insteon based devices are interoperable with Insteon based devices.

VI. CONCLUSION

Smart home is definitely going to be the reality of our future. But in this process major challenges are interoperability, security, privacy, efficient data mining techniques and constrained resources. These challenges can be overcome and many solutions have been proposed but still there is a gap for a solution with lesser hazards.

VII. REFERENCES

- [1] Gubbi Jayavardhana et al., "Internet of Things(IoT): a vision, architectural elements and future directions", Journal of Future Generation Computer Systems, Volume 29, Issue 2, 2013, Pages 1645-1660
- [2] Ngu H. Anne et al., "IoT Middleware: A Survey on Issues and Enabling Technologies", IEEE Internet of Things journal, volume 4, issue 1, February 2017
- [3] Lee In, Lee Kyoochun, "The Internet of Things (IoT): Applications, investments, and challenges for enterprises", Business Horizons, volume 58, issue 4, July-August 2015, pages 431-440
- [4] D. Raggett, "The Web of Things: Challenges and Opportunities," IEEE Computer, volume 48, May 2015
- [5] Google Fit, 2015, [https:// developers.google.com/fit/](https://developers.google.com/fit/)
- [6] Biljana L et al, "A review of Internet of Things for smart home: Challenges and solutions", Journal of Cleaner Production, 2017-Elsevier
- [7] Sarah J. Daraby, "Smart technology in the home : time for more clarity", Building Research & Information (2017)
- [8] Sergio Tirado Herrero et al. , " Smart home technologies in everyday life :do they address key energy challenges in households?", Current Opinion in Environmental Sustainability, volume 31, April 2018, Pages 65-70
- [9] <https://www.link-labs.com/blog/z-wave-vs-zigbee>