 ISSN: 2321-8169
43 - 45

Design of Multi Standard Gateway for IoT

Sreekanth V
School of Electronics Engineering (SENSE)
VIT UNIVERSITY, Chennai, India
sreekanth.v2015@vit.ac.in

Prof. BALA MURUGAN M S
School of Electronics Engineering (SENSE)
VIT UNIVERSITY, Chennai, India
balamurugan.ms@vit.ac.in

***Abstract*—** Connectivity is one of the recent trends in digital technology especially Internet of Things(IoT), within few years itself IoT had evolved in almost all the fields which includes engineering, science, Industry etc. The developments in IoT changed the classical connectivity architecture which already existed and now all the objects, digital and analog components each and everything is connected to IoT. So the need of a common platform is essential so that the objects or devices with different standards of connectivity can be brought under a common platform and eventually it can be connected to IoT so that the platform gives the flexibility of connecting different devices and it can be made as a standard for IoT connectivity. This paper proposes a system which acts as gateway to IoT for different wireless standards like Zigbee and Bluetooth. The devices already having any of this connectivity can be connected with this common platform and the platform will be connected to IoT through Wi-Fi. It act as a gateway or interface for connection between the cloud and the end device. Here three wireless standards are brought under a common platform for which the raspberry pi will act as the backbone and Zigbee, Bluetooth and Wi-Fi will be interfaced with Pi and will be connected to cloud.

Keywords*—*IoT, Gateway, Zigbee, Bluetooth, WiFi, Raspberry Pi

*****

I. INTRODUCTION

Internet now become a vital part of life and the advancements in connectivity is showing a steep increase. Over the past twenty five years the digital world had changed a lot in that the connectivity and related field has evolved in such a way that it became one of the necessities of life. Internet influenced the world in such a way that one feel like each and every thing is very close and the immense of knowledge lead to rise of new technologies. Now everyone in this world is connected due to the advancements in internet technology. Likewise now the science world is trying to connect all technologies so that different technologies can share data's and through that connectivity of different technological platforms becomes reality. This research reached the path of Internet of Things where each and every devices is connected to internet and someone need to access any device or device data he can get it from anywhere using an internet connection. The developments in IPv6 also support the implementation of IoT.

The problem which is facing is the platform dependency of the wireless connectivity; there are several ways of wireless connectivity like Wi-Fi, Zigbee, Bluetooth, etc. But all the devices are having different type of connectivity so it became a tedious task to design independent platforms for each of them and whenever we are going for such a design it will be always a dependent system either it will depend on connectivity type or software platforms. So gateways which act as bridge between device and internet or cloud are very essential for the proper implementation. Simple gateways with one protocol support can't solve the problem completely. Through that all the devices having same connectivity can be connected but devices with different types of connectivity is not possible. Now a day's gateways are available with individual connectivity but gateways with multiple types of connectivity is very essential.

For proper connectivity, gateways with platform independency are needed. So multi standard gateways are very essential for connecting different devices which are having different types of connectivity.

II. RELATED WORK

Texas Instrument already developed a device for gateway which Bluetooth device can be connected to the gateway and gateway is connected to cloud wirelessly [1]. There are works relating to the connectivity of wireless sensor networks to a common gateway [2]. But the connectivity of the devices is same in that network. The paper [4] proposes home gateway for multiple devices but the robustness of the system is weak and concurrency in performance of the different devices are little difficult in that kind of a system. There is lot of works which is based only on BLE and Zigbee combining these and incorporating it through Wi-Fi is challenging.

III. PROPOSED WORK

To design and implementing a device having Bluetooth, Wi-Fi and Zigbee connectivity which can be treated as a multi standard gateway for IoT. By using this device different wireless standards will be connected to a common platform and through the platform different devices will be connected to IoT. Zigbee and Bluetooth will act as the inputs for the gateway which is connected to cloud using any wireless network with the help of Wi-Fi.

IV. HARDWARE SPECIFICATIONS

A. Zigbee

Zigbee is based on the IEEE standard 11.15.4 intended to give connectivity for Personal Area Network. The technology was developed for creating low power consumption device which can communicate over a range of 10-100 meters under line of sight condition. It is a less expensive technology which is used in short distance wireless communication. Zigbee also has the capability of transferring data from one point to another through mesh networks.

B. Bluetooth

Bluetooth was also introduced as IEEE standard 11.15.1 but no longer maintains the standard. It was introduced as an alternative for RS232 communication. Since it is a short range wireless communication technique it can be used as an

ISSN: 2321-8169
43 - 45

alternative for wired RS232 communication. The advantage of Bluetooth is that it can be connect to many devices at a time and synchronization overhead is less while comparing other devices which comes on same category. It also gives a rage of 10 meters and line of sight is not necessary.

C. Gateway Interface

Here Raspberry Pi model 2 is used as gateway interface for interfacing the connectivity devices and for logical implementation of data abstraction. The model 2 is the advanced version 1 having ARM cortex A7 as CPU and having 1GB RAM. It is one of the best single board computers. Its size can be compared with credit card size and having support of audio and video streaming also. The Pi is having different operating systems and Linux also can be installed in Pi. It will support the programming languages like C, C++, Java etc and scripting language like python. Most of the applications in Raspberry Pi is written in python only.

Fig: Raspberry Pi

The System on Chip (SOC) technology is used for building the whole module which consist of peripherals like

1. 4 USB Ports
2. 40 GPIO pins
3. FULL HDMI Port
4. Ethernet port
5. 3.5mm Audio Jack
6. Camera Interface and Display Interface
7. Micro SD card
8. Video Core IV 3D Graphics

All these things are integrated in a single credit card sized module. The operating system can be loaded from the SD card.

V. BLOCK DIAGRAM

The block diagram consists of a gateway which integrates the Zigbee, Bluetooth and Wi Fi. The Zigbee connects with other Zigbee devices to get the data from it and the data is transferred to the gateway stack likewise the Bluetooth also gets the data of different Bluetooth devices. All the data manipulations are done in the gateway and then the data is transferred to the cloud using Wi Fi.

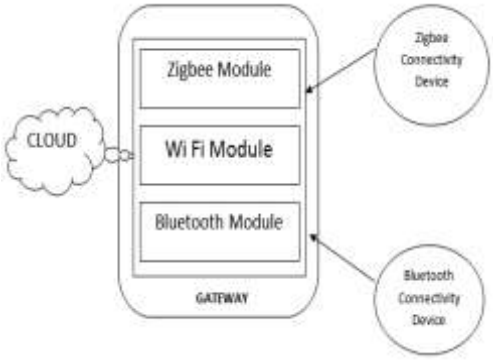


Fig: Gateway Interface

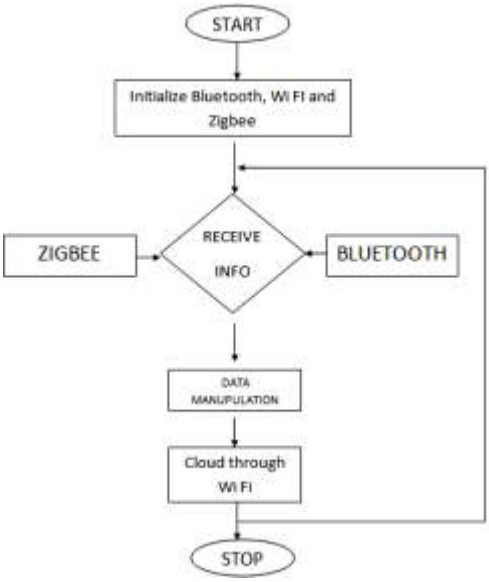
VI. IMPLEMENTATION

Raspberry Pi will be interfaced with Zigbee, Bluetooth and Wi-Fi. Through Wi-Fi the RPi will be connected to internet and which will in turn connect to the cloud service. Separate data stack is created for Zigbee and Bluetooth and other devices are allowed to connect to the gateway through these. The data transferred by outside devices is taken on the corresponding stack and diverted to cloud using cloud service protocol.

The implementation includes the connectivity of Zigbee, Bluetooth as well as the Wi Fi. The Zigbee and Bluetooth can be interfaced with the Raspberry pi through serial or USB interface and the data can be accessed in Raspberry pi. The data can be taken from the Zigbee and Bluetooth stack and it can be attached with the Wi Fi stack and eventually can be transmitted to the cloud using any of the cloud services.

Here the cloud implementation is done in Sap Hana cloud platform and in cloud the data's from the both the devices will be accessed and can do any type of analysis. The cloud platform Sap Hana will support variety of data types and is having different methods of plotting as well as analysis tools which can help in the visualization of the data with different timestamps.

VII. FLOW DIAGRAM



 ISSN: 2321-8169
43 - 45

VIII. HARDWARE ARRANGEMENT

IX. RESULT

G_CREATED	C_RAWDATA
Thu Mar 31 2016 07:47:57 GMT+0530 (IST)	56
Thu Mar 31 2016 07:47:51 GMT+0530 (IST)	56
Thu Mar 31 2016 07:47:46 GMT+0530 (IST)	56

Fig:Sap Hana Cloud

The hardware arrangement includes the interfacing of the Zigbee, Bluetooth and Wi Fi. The USB Bluetooth and the USB Wi Fi dongle is attached with Raspberry pi.

The raw values which are transferred from the different device medium like Zigbee and Bluetooth are transferred to the cloud platform using the cloud services and is displayed on the cloud dash board.

ACKNOWLEDGMENT

This work is supported by the faculties of Department of Electronics Engineering (SENSE), VIT UNIVERSITY, Chennai, India.

REFERENCES

[1] Building a Gateway for IoT, Texas Instrument.

[2] Qian Zhu_*y*, Ruicong Wang *y*, Qi Chen_*y*, Yan Liu_ and Weijun Qiny, IOT Gateway: BridgingWireless Sensor Networks into Internet of Things, 2010 IEEE/IFIP International Conference on Embedded and Ubiquitous Computing.

[3] Pratek Kumar Desai, "Symantic gateway as a service architecture for IoT interoporability," IEEE conference 2015.

[4] Seong-Min Kim, Hoan-Suk Choi, Woo-Seop Rhee, IoT home gateway for auto configuration and mamanagement of MQTT devices, IEEE conference 2015.

[5] Abd Elwahab Boualouache1, A BLE-based data collection system for IoT.

[6] Shifeng Fang, Li Da Xu, An Integrated System for Regional Environmental Monitoring and Management Based on Internet of Things, IEEE Transactions, VOL. 10, NO. 2, MAY 201