

Design of Embedded Agent for Systems Based On Internet of Things

Anish R , Kirubakaran S

Abstract: Internet of things is an emerging technology where things are made smart and made to communicate with each other (i.e.) The Internet of Things is the network of embedded electronic devices or things embedded with electronics, software, sensors and connectivity with which it is able share or exchange data with the manufacturer, operator and/or other connected devices. Each thing or device has a unique id through which its embedded computing system is able to interoperate within the existing Internet infrastructure. For devices to communicate with other devices there should be an agent embedded within every device to transmit and receive device specific data. The project aims in designing an embedded agent, which acts as a communication medium between devices, the agent not only intends on communication but also optimizes the data of the specific device, so that the devices can share device specific data, and also introduces a communication.

Keywords--Embedded agent, IoT, IoT architecture

I. INTRODUCTION

Internet of things is an emerging technology where things are made smart and they are made to communicate with each other with an embedded agent attached to each embedded device the agent is capable of transmitting the device specific data with other devices, the data can also be stored in the cloud, so that the user can manage the devices through the internet, this paper gives an architectural overview of an embedded hardware agent which will be capable of transmitting the device specific data of the Device to which it is attached to and the data is collected in backend so that user will be able to manage the device with the data available online. The proposed architecture comprises of an intermediate hardware agent between the device and the central controller

Manuscript received April, 2016.

Anish R, ME Embedded systems, Bannari Amman Institute of Technology, Erode, India.

Kirubakaran S , Assistant Professor, Department of Electronics and Communication Engineering ,Anna University/ Bannari Amman Institute of Technology Erode, India.

The three main devices used for this architecture are a device which is intended to be made smart an embedded agent which is to be incorporated in the device which is intended to be made smart, a cloud storage medium for storing the data collected from the devices, the devices can be controlled through the internet with the available data online.

II. ARCHITECTURE

A. General Architecture of agent based device control system

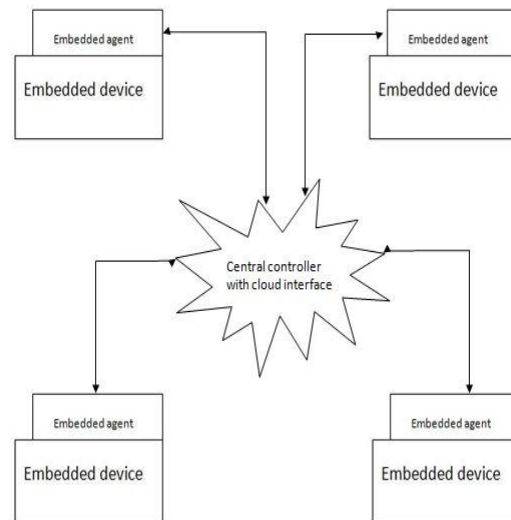


Figure: 1. General Architecture

As show in the above figure the general architecture of the embedded agent based device control system consists of an embedded agent for each embedded device, and a central controller with cloud interface.

The agent allows two way communication between the embedded device and the central controller, and it is also designed in such a way that it can it can share information with other devices in the network.

B. Design of embedded hardware agent for systems based on internet of thing

The below figure shows the block diagram of the embedded agent it shows how an embedded Device is made intelligent with the help of the microcontroller, sensors and Wi-Fi module.

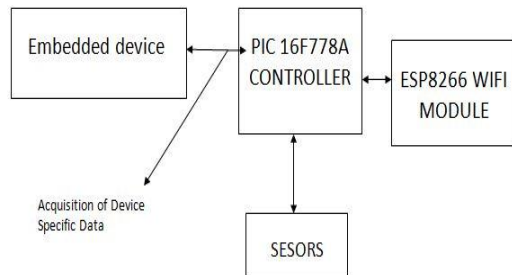


Figure:2. General block diagram

III. CONSTRUCTION AND WORKING

The embedded hardware agent consists of a microcontroller, sensors and Wi-Fi module

A. PIC 16F778A controller core features

PIC is a high performance RISC CPU with an operating speed of about 20 MHz, 200ns instruction cycle which operates with 4.0-5.5 volts it has 15 interrupt sources, 35 single word instructions. In this design PIC controller is used because of its core features which allow easy sensor and wireless module interface and it has only a minimum number of instructions which allows easy programming.

B. Sensors

Sensors are devices which are capable of acquiring real world signals and convert the physical real world signals into electrical signals. Sensors plays an important role internet of things based applications Each sensor has certain functionality for measuring the real world parameters such a temperature, humidity, pressure and other real world parameters, similarly here we are making use of some sensors according to the device to which it is being attached to.

C. Wi-Fi Module

For devices to communicate with each other and share information with each other we need a communication medium here the communication

between the devices are established using a ESP8266 Wi-Fi module some of the features of the ESP8266 Wi-Fi module are:

ESP8266 is a complete and self-contained Wi-Fi networking solution; it allows to either host an application or to offload all functions from another application processor. The ESP8266 can be used to host an application and it's an application processor capable of external flash boot up ,it has integrated cache to increase performance and to minimize the memory requirements It also serves as a Wi-Fi adapter, wireless internet access can be provided to the devices with a simple UART interface.

D. Working

As shown in the above block diagram the PIC 16f778A microcontroller is used in the embedded hardware agent design. The controller is programmed in such a way that it is capable collecting all the device specific data through the sensors and other transducer devices. The collected information is then shared with the central controller or other devices. The central controller is programmed to manage the data and performs the action of forwarding it to the cloud storage.

The stored data in turn can be used to control the devices online, the user is given the permission to manage the devices through the internet, and the intelligent embedded agent is connected to the internet via the ESP 8266 Wi-Fi module.

Thus the agent we are designing is capable of acquiring the device specific data and it forwards it to the central controller and the data available can be used for various IoT applications.

The need for this type of a system is because of the increase in IoT applications, where all the existing embedded devices are made smart with the help of the intelligent embedded agent attached to the devices, which allows all the information about the device to be made online and remotely controlled.

IV. APPLICATIONS OF EMBEDDED AGENTS IN INTERNET OF THINGS BASED SYSTEMS

A. Home automation and smart city projects

In this exemplary growing world automation plays a vital role, people needs sophistication in the

routine life, IoT is one of the growing technology with increased sophistication and which aims in making things smart. Thus any device can be made smart putting some intelligence. The intelligence can be achieved having an embedded hardware agent within the embedded devices.

B. Medical and health care application

In medical and health care domain the internet of things based systems have been developed to remotely monitor the health of the patients and to keep a record of the patient's health report. At the patients place certain embedded agents are incorporated so as to keep a record of the patient's health and the embedded agent is capable of monitoring and transmitting the patient's health information to remotely available doctor which allows the doctor to remotely monitor the patient.

C. Smart manufacturing

As the technology grows people becomes smart and they aim at reducing the manual work in industries which resulted in smart manufacturing industries where everything is automated, the machines are made smart so that they could analyse themselves and send reports to the control person with IoT integrated agents.

Thus the growth of IoT in different areas leads to the development of smarter things and it also decreases the manual work. According a survey so far the devices which are connected to the internet in nearly 10 billion, and by the end of 2025 it has been estimated that 50 billion devices would be connected to the internet. And so the embedded agent would be a best and optimal solution for the IoT applications.

V. SOFTWARE DESCRIPTION

microC PRO for PIC is an IDE for editing and debugging the programs in PIC. It is the most popular compiler for PIC microcontrollers where it lets the programmers to edit and debug programs. Once the program is compiled an hex file is generated the hex file is then dumped or burnt into the PIC 16F877A through a serial cable.

The microC is integrated development environment software specifically designed for PIC. The micro c converts the user program into object or byte codes which can be understood by the machine.

VI. CONCLUSION

With this paper its clearly understood how communication between devices is established and what are the requirements of the agent which is responsible for devices to share information among themselves for example here in this paper we have discussed how the devices share information among themselves and how the information is stored in the cloud, which in turn can be used for IoT applications. This paper gives a mere analysis of how an agent should be designed.

REFERENCES

- [1] Wei Fu Gang Chen, Ping Wang, Yang Hong, and Houyang Ge "Improvement of Home Appliance Control System in Smart Home Based on 6LoWPAN" Journal of computers, vol. 9, no. 1, January 2014
- [2] Kang Bing, Liu Fu, Yun Zhuo, and Liang Yanlei Design of an Internet of Things-based Smart Home System 2nd international conference on controls and information 2014
- [3] Renan C. A. Alves, Lucas Batista Gabriel, Bruno Trevizan de OliveiraAssisting "Physical (Hydro)Therapy With Wireless Sensors Networks iee internet of things" journal, vol. 2, no. 2, april 2015
- [4] S.Pandikumar, R.S. Vetrivel International Journal of Innovative Research in Science, Engineering and Technology Internet of Things Based Architecture of Web and Smart Home Interface Using GSMvol.36, pp.616-620, 2013.
- [5] Luigi Atzori, Antonio Iera, Giacomo Morabito. "The Internet of Things: A survey(2013)," Computer Networks, vol.54, pp.2787–2805, 2010.
- [6] Lin Yu-Ju, Latchman Haniph A., Lee Minkyu etc, "A power line communication network infrastructure for the smart home," IEEE Wireless Communications, vol. 9, pp.104-111, 2002.
- [7] V. Knivett, "Home Smart Home," New Electronics, vol.34, pp.16-18, 2001.



Anish R, ME Embedded systems, Bannari Amman Institute of Technology, Erode, India.