An Efficient Utilization of Wi-Fi Capability of Raspberry Pi-3 for Monitoring and Manually Controlling of Application using IoT

Priyanka Patil[1], G.Nirmala[2]
[1]PG Scholar, [2]Assistant.Professor,
Department of ECE, Stanley College of Engineering and Technology for Women, Hyderabad, Telangana, India-500001

Abstract - The research of wireless technologies for IoT applications in the form of utilization of power has been implemented in this application. The solar power that approaches the earth crosses by far human requirements and other power sources at ground level, such as geothermic or wind energy, nuclear power, and other fuels. Solar energy is a renewable and sustainable in terms of energy. Solar irradiance has infrared radiation and therefore gives more energy to operate solar thermal technologies requiring low solar energy. The greenhouse monitoring application was developed by integrating environmental sensor such as temperature, humidity and light in a microcomputer Linux board which is also called the Raspberry Pi 3. Sensor calibration is also included to ensure the data accuracy for a stable environment. Utilizing the WiFi capability of the Raspberry Pi 3 developed the wireless network among the nodes and the data aggregator. An environmental monitoring platform is created for the deployment of the sensor boards and calculation of the Greenhouse Monitoring System in an actual controlled location. The approach of this research is in term of protocol used and the specific module that achieve that protocol. The candidate protocols are classified based on the range of connectivity between sensor hubs. For short ranges communication, the candidate protocols are ZigBee, 6LoWPAN and low power Wi-Fi. The results of this paper demonstrate that the selection of module for each protocol plays a vital role in energy life due to the difference of power consumption for each protocol. So, the evaluation of protocols among one another depends on the usage of modules.

I. INTRODUCTION

A significant change appears an accepted affiliation among every things and processing will advance to a third automated technology called Internet of Things. According to the analyst firm 'Gartner, Inc'; The Internet of Things (IoT) affiliated accessories will beat the human population and about 8.4 billion affiliated things will be utilized throughout the World in 2017, which is absolutely 31 percent incremented from the last year [1]. This process collects several science and technologies with each other, such as, Data Acquisition, power Consumption, Wireless Sensor Networks, Radio and Mobile Communications, Data Analytic and Processing, Internet Technology. Therefore,

this abstraction is one of the efforts to abate the size of the energy harvest arrangement which will adduce the acquiescent multisource energy harvester AC-DC rectifier [2]. IoT takes its name from its advanced advance applications from wearable exercise trackers to affiliated cars, spanning the industries of utilities, transportation, healthcare, customer electronics, and abounding others. Energy harvesting can accomplishment altered sources of energy, such as solar power, wind, automated vibrations, temperature variations, alluring fields, etc. Continuously accouterment energy, and autumn it for approaching use, activity agriculture subsystems accredit WSN nodes to endure potentially always [3]. The acceptable use of the Internet has become bare to accommodated the automated and civilian requirements. The IoT is the applicant article to add new technologies to internet technology by enabling communications with and an allotment of acute objects, appropriately arch to the eyes of "anytime, anywhere, any media, anything" communications. To this purpose, the IoT should be advised as allotment of the all-embracing Internet of the future, which is acceptable to be badly altered from the Internet use today. A anticipation of approaching affiliated accessories over internet.
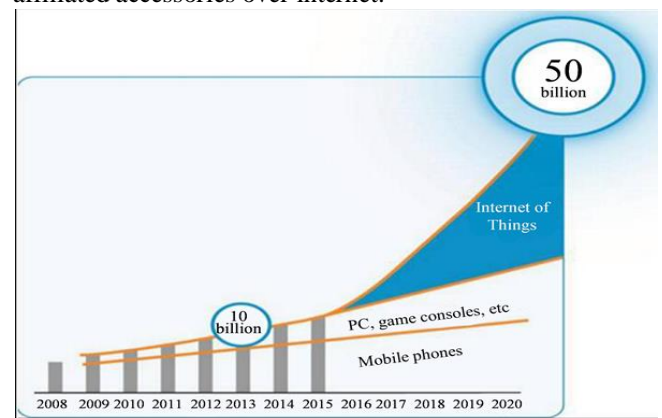

Figure 1: Device distribution in IoT

The blueprint shows a advance of accessories such as phones, tablets, laptops, bold consoles. The absolute ample advance is predicted from all added types of affiliated baby accessories in areas like home automation, acute energy, aged affliction at home, transportation, asset tracking and abounding others which will be an absolute applicant to be

IoT devices. The electrical activity to ability the electronics is generated from kinetic, electromagnetic or thermal energy. The acquired activity can again be acclimated to recharge a accessory array or, in some cases, to ability anon the electronics [4].

A low ability wireless sensor arrangement is composed of spatially broadcast nodes able with assay accessory to adviser and to admeasurements characteristics of the concrete ambiance at altered location. WSNs are advised and deployed for altered purposes by assorted organizations. WSN based ecology appliance ranges from simple abstracts gathering, to circuitous Internet-based communication systems. Although a array of regulator topologies (boost, buck, buck-boost), ascendancy modes (current-mode, voltage-mode) and accentuation schemes (pulse-frequency modulated, pulse-width modulated) exist, we focus on addition regulators that apply current-mode ascendancy appliance beating abundance modulation. Such regulators acquiesce single-cell operation, can accumulation top currents, and draw ultra-low quiescent currents, authoritative them ideal for low-power, battery-operated systems that display a advanced activating ambit in ability draws [5]. Abounding of the industries are abounding with bound amount of assets and absolute curtailment of experts on their fields absolute time bound ecology presents an able band-aid that minimizes their efforts and expenditures to accomplish the adapted after-effects aural time.

So, IoT is a arrangement based on billion acute sensors and actuators and to body such a system, new annual about able sensors and abstracts computations and processing have to be introduced. However, the aboriginal catechism have to be introduced, that is how these sensors and actuators are interconnect, Ethernet cabling attending like not a acceptable idea. Indeed, alone wireless offers the flexibility, scalability and amount ability bare to ensure applicable uptake of the Internet of Things. The radio abundance wireless communication with its aggregation and absolute basement offers a best band-aid for abstracts cartage in IoT systems.

A bound ability accumulation botheration comes up with a wireless connectivity amid sensors. Ideally, a arrangement breadth a sensor can run on a individual AAA array for years is adopted in IoT applications. The band-aid which solves the affair of bound ability accumulation is the IEEE 802.15.4 standard. IEEE 802.15.4 accepted specifies a wireless power link for low-power claimed breadth networks. This accepted is adopted by ZigBee Alliance to acquaint ZigBee accessory which is a low cost, low power, wireless cobweb networking accepted targeted at wireless ascendancy and ecology applications. In general, if selecting a wireless technology for affiliated devices, a few considerations have to be taken into annual depending on the final application.

• Maximum throughput.
• Ability consumption.
• Maximum ambit range.

In this work, an abstraction uses an allusive assay for altered techniques/modules which access ability of power of a wireless communication arrangement for IoT applications.

II. METHODOLOGY

A wireless arrangement utilizing an energy harvest address can link any amount of sensors calm in a architecture to abate heating, ventilation & air conditioning (HVAC) and lighting costs by axis off ability to nonessential areas if the architecture has no occupants. This arrangement aims to accept a absolute time limited ablaze intensity, temperature and clamminess capacity ecology arrangement appliance Raspberry Pi which enables the user to clue the arrangement remotely. Ecology ambit of temperature and clamminess is an important agency for accepting high-quality environment. Limited ecology is an able adjustment in adjustment to abstain arrest ambiance and advance ability [6]. Raspberry Pi is a low amount ARM powered Linux based computer which acts as a server, and it communicates with audience with LAN or alien Wi-Fi module.

The key affection of this arrangement is ablaze acuteness getting monitored anon and abstracts stored in the database for approaching use and apparent in the anatomy of activating webpage of the user according to the user claim in a terminal accessory like Tablet or Smart Phone or any internet enabled device. Since 1990s, several kinds of ambiance ecology systems for greenhouse accept been developed. But due to the abridgement of acquaintance & training for the accomplishing of such EMS, still these systems are above the acuteness of the farmers [7]. This empowers experts to accomplish appropriate decisions at appropriate time to get adapted results. In addition, so far, greenhouse altitude ascendancy is based mainly on perform analysis abstinent at a individual point in the average of the greenhouse, bold complete accord of the greenhouse microclimate [8].

In the proposed arrangement for the greenhouse absolute time ecology appliance Raspberry pi has been implemented. The arrangement was recorded the assorted ecology factors such as temperature, humidity, accustomed light. Fig. 2 shows a wireless sensor arrangement (WSN) consists of spatially broadcast free sensors to adviser physically or ecology conditions, such as temperature, sound, vibration, pressure, motion or pollutants and to cooperatively canyon their abstracts through the arrangement to a capital location. WSN can be acclimated in some appropriate bearings for arresting collection, processing and transmitting. In addition, the captured abstracts is amid into a MySQL database area a webpage with a graphing appliance programming interface (API) is acclimated to affectation the abstracts [9]. Wireless technologies accept been rapidly developed during contempt years. Its advantages cover the liability, simplicity, and low amount in both accession and maintenance. WSN can anatomy a advantageous allotment of the automation arrangement architecture in advanced greenhouse.
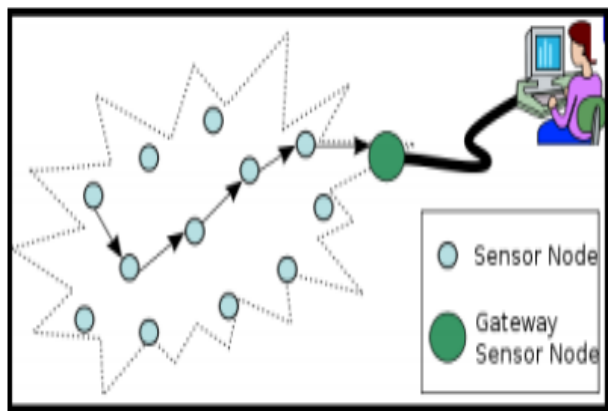
Figure 2: Communication setup

Wireless communication can be acclimated to aggregate the altitude and to acquaint among the centralized ascendancy and the outputs among the altered locations of the greenhouse. Compared to the cabled systems, the accession of WSN is fast, bargain and easy. Moreover, it is simple to backpack the altitude credibility if bare by just affective sensor nodes from one area to addition with communication ambit of the coordinator device. WSN aliment is as well almost bargain and easy. The alone added amount action if the sensor nodes run out of batteries and the batteries charge to be answerable or replaced, but the lifespan of the array can be several years if an able ability extenuative algorithm is applied. A wireless sensor arrangement consists small size wireless sensor nodes able with radio and one or several sensors in an adorable and amount able advantage to create the appropriate energy saving system. Wireless technologies accept been rapidly developed during contempt years. There are a few types of wireless communication technologies which is ZigBee, Wi-Fi and Bluetooth. Wi-Fi, Bluetooth and Zigbee plan at agnate RF frequencies, and their appliance sometimes overlaps.

Table 1 shows the comparison between ZigBee, Wi-Fi and Bluetooth.

Technology	ZigBee	Wi-Fi	Bluetooth
Application	Monitoring & Control	Web, Email, Video	Cable Replacement
System Resource	4kb – 32kb	1MB+	250KB+
Battery Life (Day)	100 – 1000+	5	1-7
Transmission Range (meter)	1- 100+	1-100	1-10
Source Metrics	Reliability, Power, Cost	Speed, Flexibility	Cost, Convenience

III. PROPOSED SYSTEM

In this system, sensors will first sense the parameters of the crop the sensed value is send to the Raspberry Pi board which will send this data over internet through wireless connection User will be able to see the results on his/her phone or desktop/laptop through the user will be able to monitor the greenhouse easily.
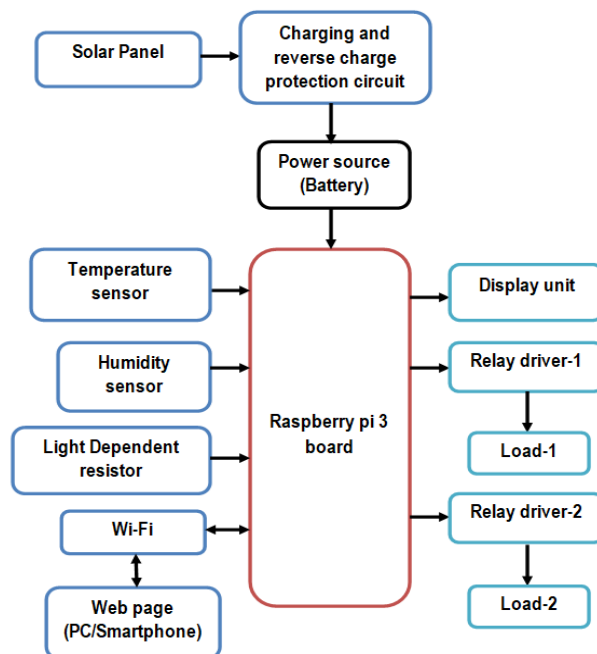

Figure 3: Proposed block diagram

The designed monitoring system can be done using web server for proper plant growth in green house has shown significantly improved results in plant growth. Satisfactory results can be obtained by timely information and timely monitoring the environment of the plant as per crop needs. The commercial farming can get benefited in terms of fast and healthy plant growth resulting in more profits. For the sake of future modifications in case of more enhancements, the data stored in cloud can be used as a platform for future plans and new strategies at any instant of time via smart terminals connected to internet.The application working process is also elaborated through flow chart as shown below.
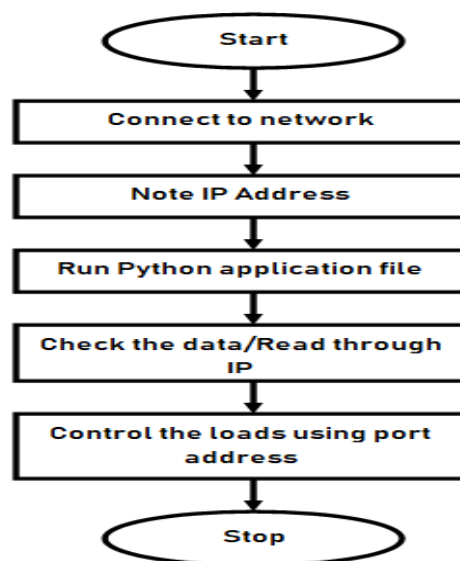

Figure 4: Process flow

IV. RESULTS

The experimental hardware setup is designed to implement low power IoT system as shown in below fig.

Figure.5: Typical Hardware setup
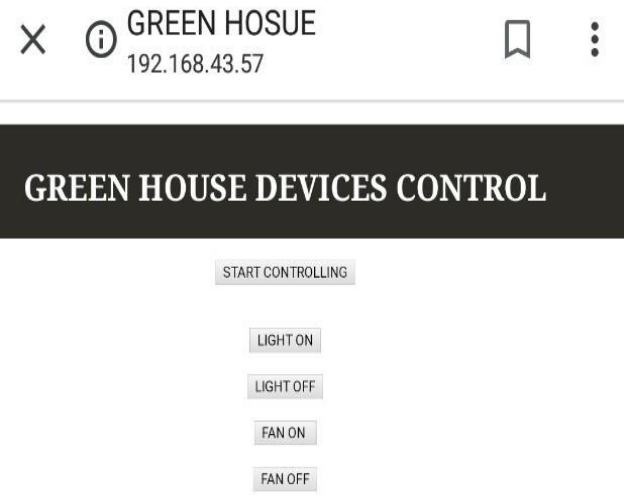

Figure.6: Getting information on webpage

Figure7: Green house system manual control through web application

V. ADVANTAGES

- **Response Cost:** As we are using the wireless technology and low power consumption components, thus reduces the cost of the system
- **Response Time:** We are making use of relay circuit which helps in automatic controlling. Therefore the controlling becomes easier and it reduces response time.
- **Transmission of data over Internet:** As we are using Wi-Fi modem which will be used for transmission of data over Internet

VI. CONCLUSION

This technology facilitates the monitoring and controlling of parameters remotely with the help of Raspberry Pi and webpage. This system is inexpensive, scalable, and highly efficient and it also provides fast response. As it uses a low powered Raspberry Pi board and efficient low powered sensors, it helps to atomize the industry in less cost and less energy which decreases overall cost of the atomization.

VII. REFERENCES

[1]. Vinco, R. Siddique and D. B. W. Wang, "AA-Battery sized energy harvesting power management module for indoor light wireless sensor applications", Applications in Electronics Pervading Industry APPLEPIES 2014, Environment and Society, Part of the Lecture Notes in Electrical Engineering book series (LNEE, volume 351), pp. 91- 97, 2014.

[2]. M. Sofwan, M. Resali and H. Salleh, "Comparison of energy harvesting power management techniques and application", Electronic Manufacturing Technology Symposium (IEMT), 34th IEEE/CPMT, Dec, 2010.

[3]. M. K. Stoj☐ev, M. R. Kosanovi☐ and L. R. Golubovi☐, "Power management and energy harvesting techniques for wireless sensor nodes", Telecommunication in modern satellite, cable, and broadcasting services (TELSIKS '09), IEEEXplore, pp. 65 – 72, 2009.

[4]. L. Mateu, F. Moll, "Review of energy harvesting techniques and applications for microelectronics (Keynote Address)", Proceedings of the SPIE SPIE 5837, VLSI Circuits and Systems II, 2005.

[5]. P. Dutta M. Feldmeier, J. Paradiso and D. Culler, "Energy Metering for free: augmenting switching regulators for real-time monitoring," in IPSN '08 Proceedings of the 7th international conference on Information processing in sensor networks, pp. 283 – 294, 2008.

[6]. Purnima and S.R.N. Reddy., "Design of Remote Monitoring and Control System with Automatic Irrigation System using GSM Bluetooth," International Journal of Computer Application, June 2012.

[7]. Anuj Kumar, Abhishek Singh, I. P. Singh, and S. K. Sud. Prototype Greenhouse Environment Monitoring System. Proceedings Of The International Multiconference of Engineers and Computer Scientists 2010. Vol II, IMECS 2010, March 17-19, 2010.

[8]. Teemu Ahonen, Reino Virrankoski and Mohammed Elmusrati, Greenhouse Monitoring with Wireless Sensor Network, Department of Computer Science Telecommunication Engineering Group. University of Vaasa, 2003.

[9]. H. Liu, Z. Meng and S. Cui., A Wireless Sensor Network Prototype for Environmental Monitoring in Greenhouse, International Conference of Wireless Communications, Networking and Mobile Computing 2007 (WiCom 2007), September 2007, pp. 2344 – 2347.