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TECHNOLOGY****C-MOTE BOARD-A REVIEW STUDY****Naga Sivarao Kodi<sup>\*1</sup>, Mohan Venkata Siva Prasad Chandaluru<sup>2</sup> & Bokka Jagadeesh Babu<sup>3</sup>**<sup>\*1</sup>M Tech Student ECSE Department, Koneru Lakshmaiah Education Foundation, Vaddeswaram,  
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**ABSTRACT**

Embedded systems an emerging field in the society, which is a combination of both the hardware and the software. Used for a specific applications. In embedded systems now the emerging trend is IoT(Internet of Things). For sending and receiving data sensor nodes are the required scenarios. The must required objects are sensors, gateway , wifi modules and some communication protocols. A processor is also the most thing present in the communication for data processing and acquisition monitoring and controlling. CDAC BANGALORE Designed a communication board called CMOTE boards used for the data communications among the motes over radio frequencies. The paper showcases the various advantages and applications of Cmote boards in the emerging field of IoT.

**Keywords:** Cmote; gateway, IoT, Radio Frequencies.**I. INTRODUCTION**

An embedded system is an electro mechanical system which is used for desired or specific application or a task. Micro processors and micro controllers are the heart of the embedded system application design. Internet of the things (IOT) provides connectivity IP to several things apart from computers of desktop, portable and mobile devices. The term "IOT" it means any physical parameter that can be detected and connected to Internet. For example, a device of monitoring of the temperature and the moisture in certain place and to re-transmit the information will turn it into a "thing" (IOT domain).

IOT refers to the interconnection of the things sensing the values capturing the data and produce the output. IOT all together a new environment in which current Internet will be smartly utilized by all new range of embedded connected things[1]. IOT provides real time monitoring and control possible for various applications.

Sensors are the building blocks of IOT which can collect parameters and low power wireless embedded communication systems transmit information to gateway devices. Gateway device will make the parameters available over internet so that parameters are globally accessible. Till now there is no dedicated network stack defined for IOT, as it is a heterogeneous network of networks. The most popular protocols used for realization of IOT are ZigBee and 6LoWPAN (IEEE 802.15.4), Bluetooth and Wi-Fi.

IOT systems developed by CDAC support lots of features which enables the researchers and students to explore different aspects and develop various applications in IOT field. As IoT is a heterogeneous network of networks, CDAC's IoT lab kits comprising of Ubimotes, BLE motes, Wi-Fi Motes along with Sensors and Gateway The communication modules developed will serve the purpose of experimenting the real world problems with the required sensor integration, they can be used as a small development platform for connecting sensors for communicating data.

## II. LITERATURE SERVEY

In [2] surveys the and stream research of IoT, key engaging advances, major IoT applications in ventures, and perceives examine designs what's more, challenges. An essential responsibility of this review paper is that it consolidates the present front line IoT in organizations efficiently

The authors present a system in [3] for acknowledging vitality productive savvy homes in view of remote sensor systems and human movement discovery. Their work depends on the possibility that most of the client exercises at home are identified with an arrangement of electrical machines which are important to play out these exercises. In this way, they indicate how it is possible to perceive the customer's present activity by checking his fine-grained apparatus level imperativeness usage. This association between practices what's progressively, electrical machines makes it possible to perceive contraptions which could be wasting imperativeness at home. Our framework is made in two sections. On one hand, the development acknowledgment structure which is accountable for perceiving the customer's available activity in light of his essentialness usage.

The authors penned in [4] that a sensor hub, otherwise called a mote (predominantly in North America), is a hub which is fit for playing out some preparing, gathering tactile data and communicating with other associated hubs in the system. A mote is a hub yet a hub is not generally a bit. We thoroughly analyze the chose WSN bits under these assorted headings, highlighting the particular bit's execution under each class.

In paper [5] author talks about the advancement towards the first incorporated radio-recurrence distinguishing proof (RFID)- empowered remote sensor organize framework utilizing ultra-high recurrence/ radio recurrence (UHF/RF) RFID-empowered sensor hubs and inkjet printer gadgets innovations on adaptable and paper substrates interestingly.

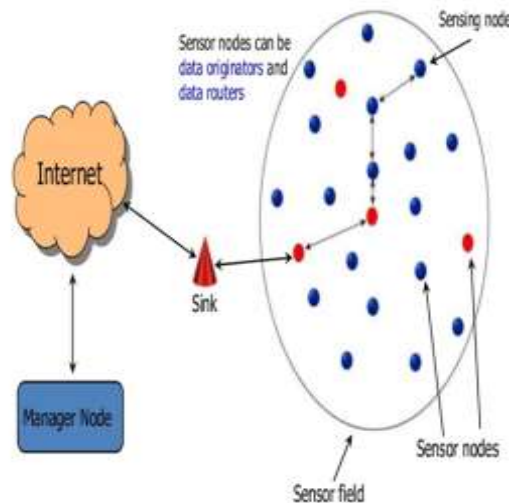
Paper [6] explains that In the previous 10 years, remote sensor systems have developed from a hypothetical idea to an expanding present day innovation. In this paper, we introduce a similar survey of a few remote sensor organize bits. We break down these WSN gadgets under various distinctive parameters and criteria, counting handling capacity, expected lifetime and estimation abilities.

In paper [7] creators influenced a study outline to work intends to give a comprehension on the distinctive remote bits open in the market. This will enhance future pros to pick remote modules which might be most proper for their application needs. Distinctive parameters related to the specific likewise, use characteristics of WSNs were considered in this review. This survey additionally centers with the investigation around particular RF modules in light of particular parameters like repeat of undertaking, transmission control, beneficiary affectability, interface instrument, data rate, dynamic, rest and close down current uses, range and cost included.

## III. WIRELESS SENSOR NETWORKS

WSN are used to sense the environmental conditions. Numerous sensors are used to sense the environment. The sensors wirelessly include the temperature, pressure, humidity etc. Fire sensors can also be included wirelessly used to detect the fire presence in the forest areas.

For example if we consider the forest area contains many trees and animals. If at all any fire accidents occur in forest area the fire sensors activated there and it senses the fire there and detects the fire stores the data In the cloud. Whenever the user requests the data then the sensed and stored data is sent to the end user.



**Figure 1: Wireless sensor network**

#### IV. C-MOTE BOARD

C-mote board is designed by the CDAC Bangalore used for the purpose of communication of data packets over radio frequencies. The major components present in the C-mote boards are the MSP430 microcontroller, Reset, UBISENSE, Communication protocols like ZigBee. Some external ports are also available in the C-mote boards. The C-mote board must be configured.

With the Linux flavored operating system for working purpose. Without configuring the board we cannot move an inch with the board. For configuration purpose WSNDC files must be required which contains all the wireless sensor network data acquisition controlling and monitoring communication protocols. The C-motes uses radio frequencies for communication in the network. All the sensors in Wireless sensor networks use the radio frequencies and also the communication protocols like UART, ZigBee etc.

C-mote can be used to setup and test different wireless sensor network applications. C-motes can be configured into different network device types like Coordinator, End Device, Router and can be used to test and develop different application and routing protocols. The Coordinator device acts as a data aggregator, the End Device acts as the data collector and the Router acts the range extender.



**Figure 2:- C-mote board**

#### UBISENSE

Ubisense is a module of interface of sensor designed by CDAC Bangalore the module is used for connecting Ubimote Across 20 sideburns. The module consists of a wide Scale of sensors, such as temperature, moisture, light Intensity, smoke detector and also a buzzer connected to the sensors. It provides High precision for sensors

of temperature, moisture and the intensity of the measured light. Temperature and Sensor of moisture that uses in the Ubisense meeting.

### MSP430 microcontroller

The MSP430 is a microcontroller that has low power utilization of inherent gadgets. The current out of gear mode might be under 1  $\mu$ A. The upper focal preparing unit. The speed of 25MHZ is available in the microcontroller. You can backpedal for bring down power utilization. The MSP430 has 6 diverse low-control modes; all tickers and CPU are de-empowered in low-control mode 4. Likewise, the MSP430 contains actuation clocks underneath 1 microsecond, permitting the microcontroller to go into suspension for more, limiting their present normal utilization. The gadget has an assortment of setups with peripherals: inward oscillator, clock that incorporates PWM, guard dog, USART, SPI, I<sup>2</sup>C, ADC of 10/12/12/14/16/24 bits and brownout restart circuit. Some fringe alternatives that they use with less recurrence are the comparators, operation enhancers in the chip for the molding of signs, 12-bit DAC, LCD controller, equipment multiplier, general serial transport and direct memory access for ADC yields. All gadgets are coordinated programmable by means of JTAG (four finish links or Spy-Bi-Wire) or an inherent boot loader (BSL) that utilizes UART as RS232 or USB on gadgets with USB bolster. There are a few restrictions that are utilized as a part of more intricate incorporated frameworks. The MSP430 does not have an outer memory transport, it has just on chip memory, it isn't sufficient for the enormous applications, DMA controller is likewise associated with the MSP430 small scale controller without DMA it is particularly hard to exchange the information from back and forth of the controller.

### Reset

Reset button is common in electronic devices. In the C-mote board an external reset pin is available to reset the whole device. Whenever we press the reset button in the c-mote board the entire device goes in to the sleep mode or in to the starting position.

### WSNDK folder

WSNDK can be used for:

- Establishing IEEE802.15.4 based wireless sensor network.
- Exploring wireless sensor network like peer to peer, mesh and star topologies.
- ZigBee based protocol projects like ambient and room temperature control, activity based lighting, distributed temperature measurement etc.
- Secured wireless data transmission using AES algorithm.

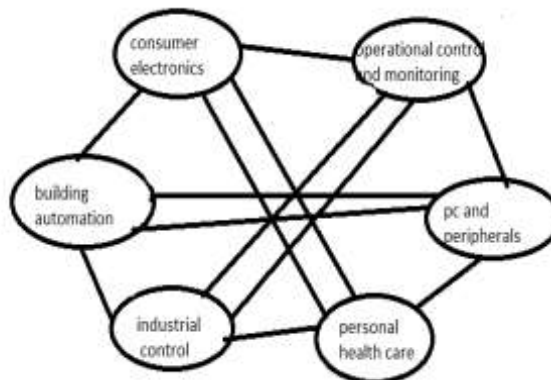


Figure 3: wsndk usage

### Sensors

The LM35 is a temperature sensor used as a piece of the sheets to perceive the regular conditions it is inbuilt in this way called a consolidated circuit. It gives exactness a yield voltage straightforwardly in respect to the Centigrade temperature. The device has great position over direct temperature sensors in Kelvin is, the customer isn't subjected to subtract an immense relentless voltage from the yield got in Centigrade scaling. The LM35 device does not require any outside trimming to give ordinary right nesses. The device gives Low cost by trimming. The low-yield impedance, straight yield. Single power supplies are used as a piece of this contraption.

## UART

A UART (Universal Asynchronous Receiver/Transmitter) is the asynchronous communication protocol used for serial data transmission over two devices called Data terminal equipment and Data communication equipment. RS-232C Data Terminal Equipment (DTE) interface is present in UART to establish communication between modems and other serial devices. The UART also converts

- Parallel bytes to serial
- Stream of serial bits are converted in favor of the computer readable format
- Parity bit is added for error checking
- Start and stop bits are present to know the starting and ending point of the data.
- Handles interrupts from the keyboard and mouse.

## V. CONCLUSION

CDAC Bangalore designed a C-MOTE which is a communication board and an IoT application system. Used for the communication purpose presents an UBISENSE which includes so many sensors and the data sensed by those sensors such as temperature, pressure, humidity, proximity. To send the data radio frequencies are used over the network and some communication protocols like ZigBee, wifi, uart and also the micro controller like MSP430 which is a low power consumption 16 bit micro controller. so many communication and wireless applications takes place

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