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Survey of Hardware Platforms for Wireless Sensor Networks

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ABSTRACT

Wireless Sensor Networks (WSNs) have self-organized networking capabilities with or without fixed infrastructure. Wireless sensor node is the chief component in WSN architecture based hardware platforms. Various hardware platforms are available and their review is an important step in the direction to further explore for the research issues in WSNs. This paper is an effort in this direction to survey the present state of the hardware platforms along with the nodes for WSNs.

Keywords: *WSN, Wireless Sensor Networks, Node, Platform*

1. INTRODUCTION

A typical Wireless Sensor Network (WSN) is composed of sink connected with numerous sensor nodes. The prime purpose of the integrated ecosystem of the WSN is to collection information thru sensors (information sensing), processing the collected information (computation) and sharing the same on the wireless/wired network of nodes and centralized station. Application development for such a complex system needs a good understanding of the hardware entities of WSN ecosystem. This paper is organized as follows. Section 2 presents the brief overview of the hardware platforms that have been proposed. Section 3 surveys the important entity of WSN – the sensing nodes. Section 4 presents the recommendations from the perspective of doing further research on WSNs[1]..

2. HARDWARE PLATFORMS

In order to understand the details of the hardware platform, one must focus on the basic hardware architecture of WSN as shown in fig 2.0

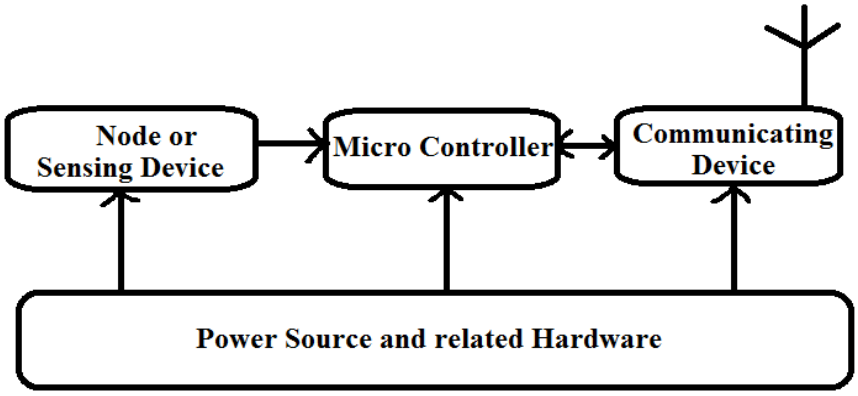


Fig 2.0: WSN Architecture

As shown in fig 2.0, the Communicating Device gives the communication capabilities to the WSN via radio or like media. Microcontroller is composed of hardware along with connecting channels with the required software to manage the WSN operations. Node or sensing device is a sensor an actuating device which has wirelessly connecting capabilities[2][3]. Power source (presently lithium cells are the most used power source) and related hardware is the heaviest component in the ecosystem of the WSN. Broadly there are two categories of hardware platforms available based upon the communication, processing, power and memory capabilities – Low end platforms and High end platforms.

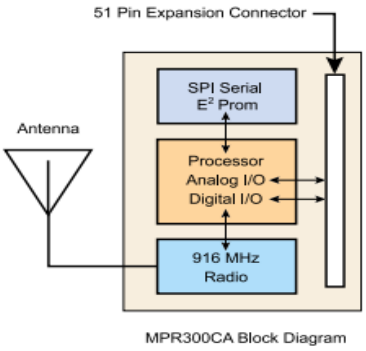
2.1. MICA

Application opportunities for smaller than expected remote detecting gadgets incorporate stock resource following, side of the road traffic example and open parking space identification, individual plant observing for accuracy farming, territory checking in nature protects, and progressed constructing security and robotization. The military could cover fields with sensors to identify troop development. Sensors could empower structural specialists to measure the underlying uprightness of structures and scaffolds after tremors or flames. Coordinating a huge number of detecting and control focuses could give new experiences into the condition of the world. Taking advantage of nearby correspondence and application-explicit conventions can definitely decrease size, cost, and power use in remote gadgets[5].

These gadgets won't have to speak with the closest high-power control tower, however just with their nearby companions. Distributed systems administration strategies give an adaptable lattice like interconnect VAN that sends information between large numbers of small inserted gadgets. A modest bunch of the gadgets could go about as scaffolds between a nearby installed correspondence network and a conventional information organization. Figure 1 portrays an accuracy horticulture sending a functioning area of use research. Specialists are growing new calculations for information total, impromptu directing, and appropriated signal handling for low-power peer-toper remote organizations. As scientists imagine more modest and cheaper gadgets, the scope of use situations develops significantly. The Mica remote stage fills in as an establishment for the arising prospects. Envisioned the Mica stage measures 1.25 × 2.25 inches, runs the TinyOS working framework and is appropriate for self-designing multichip remote organizations.

With detecting, correspondence, and I/O capacities, Mica can at the same time go about as an information switch, sensor point of interaction, and control point. Almost 100 examination bunches as of now use Mica hubs to investigate organizing methods, information examination, conveyed calculations, arranged administrations, programming, and novel applications[4]. Mica was made with off-the-rack equipment, however the design and its capacities address what could be executed in only a couple of square millimetres of custom silicon. Mica's adaptable plan fills in as a structure block for making productive application explicit conventions. Rather than characterizing restricted, normalized application interfaces, Mica gives a bunch of luxuriously interconnected natives (like information serializes and timing extractors) to work with cross-layer improvements. To investigate novel frameworks draws near, specialists can foster modified conventions custom-made to their application; Mica doesn't need utilization of predefined conventions.

BLOCK DIAGRAM	SPECIFICATION	ACTUAL DEVICE



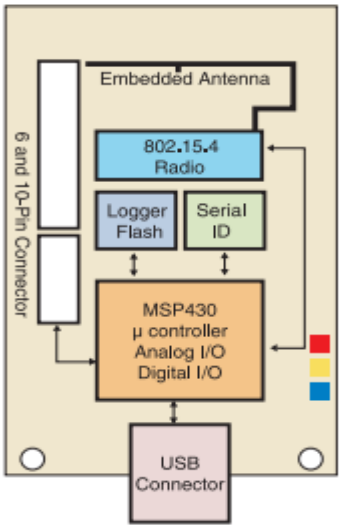
Microcontroller	MPR300CB
Speed	4MHz
Flash	128KB
SRAM	4K
EEPROM	4K
Serial Comm	UART
Processor Power Draw	
RF	916MHz
Data Rate	40Kbits/sec
Power	2XAAbatteries
Radio Range	100 feet

SOURCE: https://www.willow.co.uk/MICA.pdf

2.2. TELOSB

Its power lifetime is around 3-6 months relying upon how regularly the sign is sent back to the server, which are to some degree short for clinical applications. Its radio parts can't be upgraded (we can't utilize a superior radio handset/receiving wire to arrive at a more drawn out distance). It is a ultra low-power remote module expected for sensor networks applications[6]. The bit stage offers the on-chip RAM of 10 KB and furthermore furnishes IEEE 802.15.4 Chip on radio with an incorporated on-board receiving wire giving up to 125 m of reach, organized around a TI MSP430 microcontroller. TelosB bit is additionally alluded to as the Tmote Sky.

BLOCK DIAGRAM	SPECIFICATION	ACTUAL DEVICE



Microcontroller	TPR2400CA
Speed	4MHz
Flash	48KB
SRAM	10K
EEPROM	16K
Serial Comm	UART
RF	2400MHz
Data Rate	250Kbits/sec
Power	2XAAbatteries
Radio Range	100 feet

SOURCE: https://www.willow.co.uk/TelosB_Datasheet.pdf

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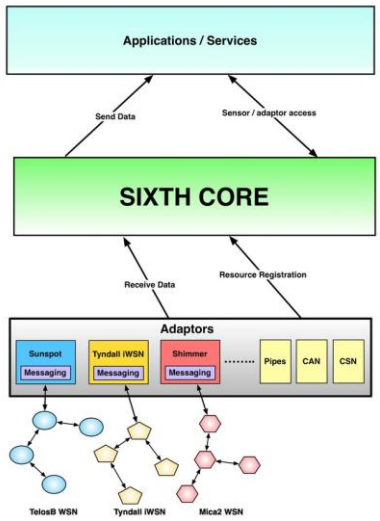
2.3. SHIMMER

(Secure Health with Intelligence, Modularity, Mobility and Experimental Reusability) SHIMMER is completely incorporated with BioMOBIUS significant level application climate which empowers quick prototyping. It is a Wireless Sensor Platform for Non-invasive Biomedical Research. It empowers quick prototyping of biomedical examination applications[7]. Gleam DESIGN stage involves a baseboard which gives abilities like, Sensors calculation like a detached slant vibration sensor, A PIR sensor is utilized as power saving wakeup trigger when client draws near information capacity that work with recording of information to micro-SD card. An interchange incorporates radio CC2420, Bluetooth and IEEE 802.15.4. Furthermore, it is additionally having a remembered Daughterboard association for it. Shine additionally upholds TinyOS-2.x. Shine is an incredibly adaptable sensor stage. It can consistently grow to meet different biomedical investigates.

BLOCK DIAGRAM



SPECIFICATION

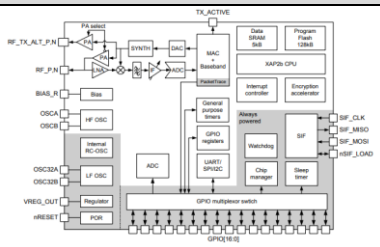
Microcontroller	**MSP 430**
Speed	24MHz
Flash	256KB
SRAM	16K
EEPROM	16K
Serial Comm	RN32
RF	2400MHz
Data Rate	250Kbits/sec
Power	Li-on 450mAh
Radio Range	----

ACTUAL DEVICE

SOURCE: https://shimmersensing.com/wp-content/docs/support/documentation/ConsensysPRO_Spec_Sheet_v1.1.0.pdf

2.4. EM250

The EM250 incorporates 128 KB of locally available Flash Read Only Memory (ROM). It additionally takes into account three unique methods of activity. The Active activity will take into consideration execution of the program code, ordinarily utilizing 8.5 mA of current. The Idle activity takes into consideration the MCU to close down until a hinder happens while permitting peripherals and the handset to work typically[8]. The EM250 additionally takes into account a Deep Sleep activity which shuts down the MCU and Transceiver until either an outer hinder or a clock wakes the gadget. In the Deep Sleep activity, the EM250 regularly utilizes 1.5 mA of current. The EM250 has four ADCs, of which two are utilized for utilization of catching simple information. The EM250 likewise has the capacity of imparting over sequential fringe interface (SPI).

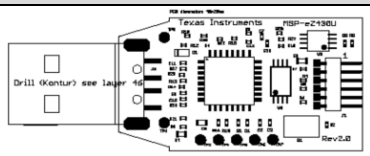
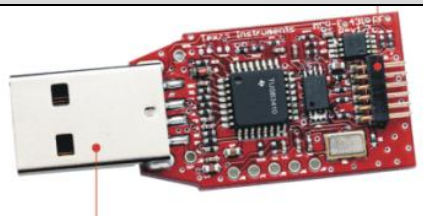
BLOCK DIAGRAM	SPECIFICATION	ACTUAL DEVICE
	**Microcontroller** / **EM 250** Speed / 2.4GHz Flash / 128KB SRAM / 5K EEPROM / 16K Serial Comm / IEEE 802.15.4 RF / 2400MHz Data Rate / 250Kbits/sec Power / 4xAA battery Radio Range / ----	
SOURCE: https://datasheet.octopart.com/EM250-RTR-Ember-datasheet-129456.pdf		

2.5. eZ430-RF2500

The eZ430-RF2500 is a finished USB-based MSP430 remote improvement device giving all the equipment and programming to assess the MSP430F2274 microcontroller and CC2500 2.4-GHz remote handset. The expense of the debugger and advancement instrument programming is $29 and the objective board for example bit is $20. The debugger is inconspicuous, permitting the client to run an application at max throttle with both equipment breakpoints and single venturing accessible while consuming no additional equipment assets. The eZ430-RF2500T target board is an out-of-the container remote framework that might be utilized with the USB troubleshooting point of interaction, as an independent framework regardless of outer sensors, or might be fused into a current plan. eZ430-RF2500 highlights incorporates USB troubleshooting and programming point of interaction including a driverless establishment and application backchannel[9]. It is having 21 accessible advancement pins.

Exceptionally coordinated, super low-power MSP430 MCU with 16-MHz execution is additionally given with it. Two universally useful computerized I/O pins associated with green and red LEDs for visual criticism. Interruptible press button for client criticism is available. MSP430F2274 is enjoying the benefits of 16-MIPS performance,10-bit SAR ADC, Two inherent functional speakers, Watchdog clock, two 16-cycle clocks, USCI module supporting UART/LIN, (2) SPI, I2C, or IrDA, Five low power modes drawing just 700 NA in backup. CC2500 is enjoying the benefits of 2.4-GHz radiofrequency (RF) handset. Programmable information rate up to 500 kbps, Low current utilization eZ430-RF2500 target board was intended to improve for factors. The eZ430-RF2500 can be utilized as an independent improvement apparatus. The objective board includes a MSP430F2274 and a large portion of its pins are effectively available[10][11].

The Devices Supported The eZ430-RF USB troubleshooting connection point might be utilized as a standard Flash Emulation Tool through its Spy-Bi-Wire interface. The eZ430-RF USB investigating point of interaction upholds the accompanying MSP430 families: MSP430F20xx and MSP430F22xx

BLOCK DIAGRAM	SPECIFICATION		ACTUAL DEVICE
	**Microcontroller**	**eZ430-RF2500**	
	Speed	2.4GHz	
	Flash	128KB	
	SRAM	5K	
	EEPROM	16K	
	Serial Comm	UART	
	RF	2400MHz	
	Data Rate	250Kbits/sec	
	Power	2xAAA battery	
	Radio Range	----	

SOURCE:
https://www.ti.com/lit/ug/slau227f/slau227f.pdf?ts=1665858971739&ref_url=https%253A%252F%252Fwww.google.com%252F

3. CONCLUSION

Remarkable advancement in semiconductor thickness has been recorded through Moore's Law which gauges a multiplying of cost execution basically at regular intervals. Despite the fact that the constraints of crude execution this benefit is probably going to confront difficulties. In any case, given expanded use of microcontrollers and remote handset innovation, large scale manufacturing of modest, practically expendable hubs with capacities surpassing contemporary gadgets is reasonable before the decades over.

In this time, it is normal that not just more proficient conventions and organization systems will exist, informed by iterative preliminaries of plans, yet that new ages of WSN hubs will offer superior capacities in the spaces of remote correspondences (further developed adaptability and expanded information rates), locally available handling and innovation. A model would be the potential for further developed dependability oscillators to empower gatherings of hubs to make conveyed beam forming transmissions. A studying of the attributes of the past and arranged WSN equipment stages will be very helpful to show patterns in the plan of future conventions.

4. REFERENCES

1. http://www.infineon.com/cms/en/product/index.html
2. http://www.microstrain.com/product_datasheets/2400_v-link_datasheet.pdf
3. http://www.adaptive-wireless.co.uk/wp-content/uploads/TEHU_1121_ver1_2011-Adaptive.pdf
4. http://www.ni.com/wsn/
5. http://bullseye.xbow.com:81/Products/Product_pdf_files/Wireless_pdf/Stargate_Datasheet.pdf
6. http://www.hoskin.qc.ca/uploadpdf/Instrumentation/CrossBow/hoskin_NB100_47e010f295856.pdf
7. http://webs.cs.berkeley.edu/retreat-1-03/slides/imote-nest-q103-03-dist.pdf
8. http://wsn.cse.wustl.edu/images/e/e3/Imote2_Datasheet.pdf
9. http://www.cs.ucsb.edu/~nchohan/docs/moteManual.pdf
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11. http://www.snm.ethz.ch/Projects/EyesIFXv1