INTERNATIONAL RESEARCH JOURNAL OF MANAGEMENT SOCIOLOGY & HUMANITIES

ISSN 2277 – 9809 (online)
ISSN 2348 - 9359 (Print)

An Internationally Indexed Peer Reviewed & Refereed Journal

www.IRJMSH.com
www.isarasolutions.com

Published by iSaRa Solutions

A REVIEW ON WIRELESS SENSORNETWORKS

Navita

Department of Computer Science,

Vaish College, Rohtak, Haryana

ABSTRACT

Present era is of Information and Communication Technology (ICT) and there are number of researchers are going on wireless Sensor Network (WSN). In Computer Science, Wireless Sensor Network is the current research field. A Wireless Sensor Network can communicate the information through wireless devices. Aim of this paper highlights WSN, its applications. It also contains various security protocols to make WSN a secure Network.

With advancement in WSN, small and low cost sensor nodes become available, which have capabilities of wireless communication, sensing various types of environmental conditions and data processing. There are different types of routing protocols depending upon application and network architecture. Routing protocols provide path in the network and efficient multi-hop communication. WSNs can be found in a various applications like civilian and military worldwide which embrace enemy intrusion detection, object tracking, patient monitoring, habitat monitoring, fire detection and battlefield.

Keywords: *WSN Applications, Security, Wireless sensor network, Routing protocols,*

Flat routing protocol, Clustering based protocol, Location based protocol.

INTRODUCTION

Wireless Sensor Network (WSN) is a network of large number of static sensor nodes. It is a network of devices which is capable in Computation and Communication. WSN provides a bridge between real and virtual world. In fig [1.1] components of wireless Sensor Network are nodes, Internet gateway, and software. The Nodes interface with sensors to monitor their environment. In WSN, Gateway is used to communication b/w the wireless and wired medium that can be collect, process, analyze and present the measurement. Routers are a measurement of the node can use to extend distance and reliability. WSNS is collect information method to build the data and communication with the system which will improve the reliability and efficiency of the sensor systems.

Wireless sensors monitor various factors such as pressure, temperature, vibration and conciseness when arranged in a spatially distributed network. Data is sent cooperatively to the monitoring location where it is processed. Wireless sensor network is a network of large number of mobile and static sensor nodes that forms wireless network using multi-hop and self-organization method. Its main purpose is collaboration of detection, processing and transmission of the information of object monitoring in the areas of network coverage. It is basically a network of minute devices capable of computation, communication and sensing. WSN provides a bridge between real and virtual worlds. It has capability to observe previously unobservable at a time resolution over large spatiotemporal scales.

WSN consists of programmable micro devices or sensor nodes which monitor various parameters of the environment. The 3 essential parts of sensor network are sink node, sensor node and target node. Sensor nodes are backbone of whole network; these are responsible for data acquisition, processing and transmission of data. The collected data is forwarded to the sink node that's why the sink node is placed in such a way that it has great impact on lifetime and energy consumption of WSN. The components of sensor nodes are assembled on a single PCB or more than one PCB depending on the application.

The technologies used in WSN are time synchronization, network protocol, localization, security administration, data aggregation and power management. In WSN study of routing protocols is a key point .The routing of WSN differs in various ways from conventional routing of fixed network. Problems occur in WSN are no infrastructure is employed, wireless links are unreliable, sensor nodes may fail and the protocols must be energy efficient.

WSN Nodes interfaced with sensors

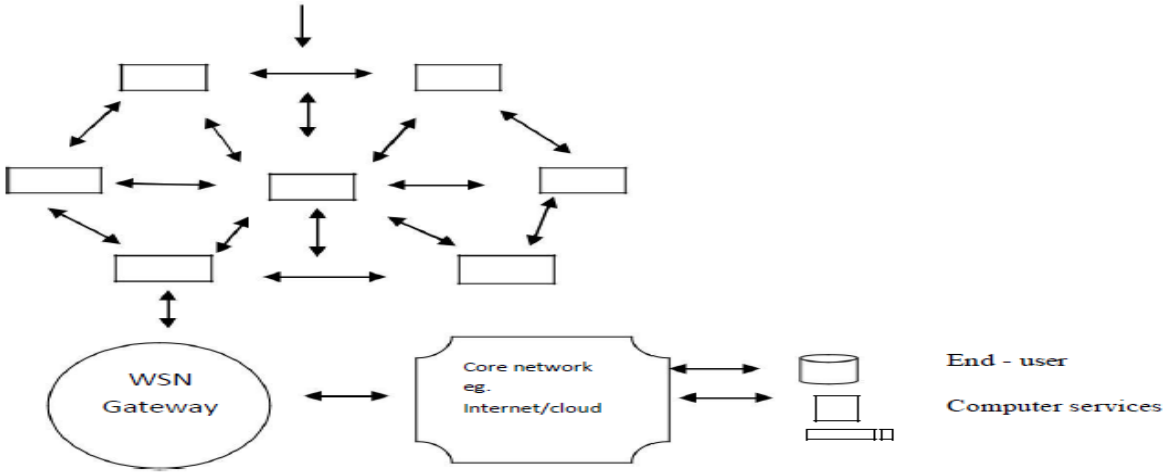

Fig [I.I]: Component of wireless sensor networks

APPLICATION OF WSN

WSN is used in many fields such as environmental/earth sensing applications, area monitoring, industrial monitoring, Health care observation, Air pollution observation, Forest fire detection, Water quality observation, data logging as shown in fig [2.1].

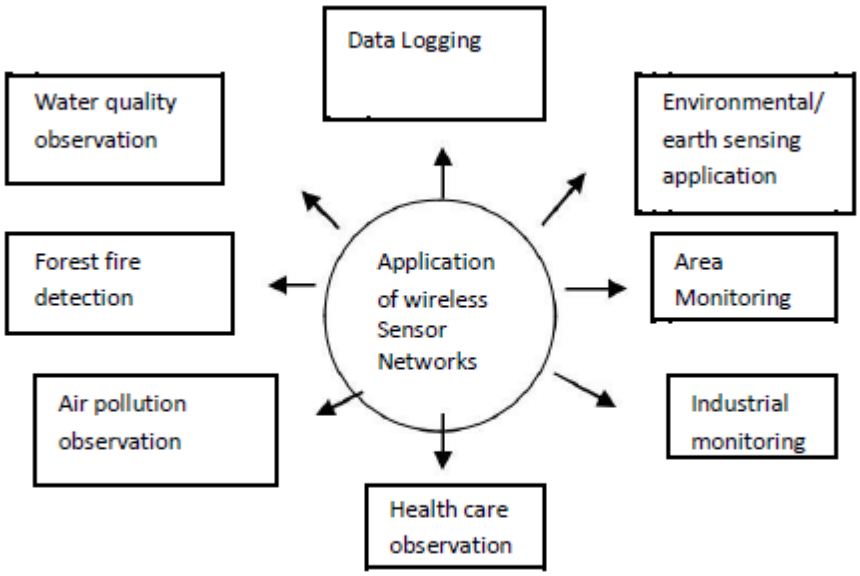

Fig 2.1: Applications of WSN

Environmental applications

WSN is becoming an integral part for monitoring of pollution in air, water quality monitoring, natural disaster deterrence, forest fire detection, landslide detection,. These applications involve sensing temperature, light, humidity and quality of air. For monitoring of environment technical knowledge about wireless networks and its protocols is not sufficient. The knowledge about ecosystem is necessary condition.

Health care applications

These applications are characterized in two ways: wearable and implantable devices. Wearable devices are used on the body and implantable devices are implanted inside the human body. Sensors can be used to monitor the location, body position and measurement of ill patients in hospitals as well as in home. For example, sensors are deployed in patients home to examine the position and behavior of patient. If patient falls and require instant attention, it gives signal to doctor for immediate assistance.

Agricultural applications

It involves precision agriculture monitoring to check environmental conditions effecting crops by tracking birds, insects and other animals. Soil moisture and air humidity can be detected by wireless sensor network in order to control irrigation. The advantages using WSN in agriculture is low power consumption, less cost, self-organizing property which includes rapid deployment of network. By the use of wireless sensor network farmers need not to bother about maintenance of wiring in different environmental conditions. Pressure transmitters can be used to monitor water tank levels in order to monitor gravity feed water.

Structural monitoring

To monitor condition of building, movement inside building, construction, bridges & flyovers. With the use of WSN buildings, bridges, flyovers and other structures can give their status statistics to the management and then management can repair buildings according to their priority. That's way these structures are known as intelligent buildings.

Intelligent home monitoring

The intelligent living environment provides more comfort and convenience to human beings. WSN is deployed to run all sorts of furnishing automatically and work together. Smart home environment is synergy of technology and services by using home networking for safety, communication, security, comfort, energy savings and automating. Such as wireless sensors are deployed to read utility meter in a home like gas, water, electricity and then transmit readings the distant centers.

Military applications

Wireless sensors network has characteristics like strong concealment, fault tolerance and self-organization as so the wireless sensor network can be used effectively in military Communication, Command, Targeting system Control and Computing, Intelligence, Surveillance, Reconnaissance. Many countries have spent their resources to research in this direction. "Smart dust" is a current project going on which is military application research project. Temperature, light vibration, magnetism, or chemicals can be detected using smart dust which is basically a system of many minute micro electromechanical systems (MEMS) such as robots, sensors or any other devices. "Smart dust" is a system of low power, ultra-miniature sensor, computing power and low cost.

Industrial applications

WSN is used to monitor conditions of manufacturing equipment and manufacturing processes. They enable new functionality and provide significant cost savings. Wireless sensors can be

positioned in locations where it is not possible to reach such as rotating machinery and untethered vehicles. Sensors give alert alarm in case of any failure occurred. Wireless sensor network plays an important role in date logging, as live data feed is possible though sensors.

Vehicle detection

Tracking and detection of vehicle has become an important application in the field of WSN. Advanced Vehicle Location system is made up of two GPS systems, one is built-in GPS satellite receiver that is basically used to compute accurately the position of vehicle and other one is the reliable GSM network to transmit the position coordinates to a control center. The system with features like two way voice communication and SMS capability, paves way for an efficient management and emergency handling framework.

Congestion control

Reducing the road traffic congestion is a major challenge for city authority. This system will be built based on sensor network which will detect the congestion on the road and broadcast the congestion information to the drivers in order to detour for avoiding congestion.

RFID indoor tracking system

WSN along with RFID (Radio frequency identification technology) tag is deployed to provide location-based service more to give more precise results according to different needs. Using RFID low cost tags are deployed on objects and human beings in order to monitor and track their position in limited indoor area. WSN-RFID convergence is considered in context-aware systems with indoor positioning capabilities, where data from WSN and RFID systems can be used to improve and upgrade the position information associated with collected data. RFID Tag Indoor Localization by Fingerprinting methods is a promising research in the field of WSN.

SECURITY COMPONENTS IN WSN

Security is more important in WSN. WSN require security protection of integrity, availability, confidentiality, non-repudiation and user privacy. These security components describe following:-

Data Integrity

It ensures that the message will not be altered during communication. A deadly node can cause the network to work improperly by disrupting the message.

Data Freshness

Data freshness means that the data is the latest and ensures that no adversary can resend the old messages later in the network.

Availability

It ensures that the expected network services are available even in the presence of denial-of-service attacks. Availability focuses on technical terms, hacking, attacks and making the system cabable of all the sources of that system.

Data Authentication

Which ensures that the communication among nodes is genuine that is malicious node cannot masquerade as a trusted network node.

Data Authorization

It ensures that only the authorized sensors are always involved in providing information to network services & note the unauthorized sensor nodes.

Microcontroller

Microcontroller performs tasks, processes data and controls the functionality of other components in the sensor node. Other alternatives that can be used as a controller are: General purpose desktop microprocessor, Digital signal processors, Field Programmable Gate Array and Application-specific integrated circuit. Microcontrollers are most suitable choice for sensor node. Each of the four choices has their own advantages and disadvantages. Microcontrollers are the best choices for embedded systems. Because of their flexibility to connect to other devices, programmable, power consumption is less, as these devices can go to sleep state and part of controller can be active. In general purpose microprocessor the power consumption is more than the microcontroller; therefore it is not a suitable choice for sensor node. Digital Signal Processors are appropriate for broadband wireless communication. But in Wireless Sensor Networks, the wireless communication should be modest i.e., simpler, easier to process modulation and signal processing tasks of actual sensing of data is less complicated.

Transceiver

Sensor nodes make use of ISM (Industrial Science and Medical) band which gives free radio, huge spectrum allocation and global availability. The various choices of wireless transmission media are Radio frequency, Optical communication (Laser) and Infrared. Laser requires less energy, but needs line-of-sight for communication and also sensitive to atmospheric conditions. Infrared like laser, needs no antenna but is limited in its broadcasting capacity. Radio Frequency

(RF) based communication is the most relevant that fits to most of the WSN applications. WSN's use the communication frequencies between about 433 MHz and 2.4 GHz. The functionality of both transmitter and receiver are combined into a single device know as transceivers are used in sensor nodes. Transceivers lack unique identifier. The operational states are Transmit, Receive, Idle and Sleep.

Current generation radios have a built-in state machines that perform this operation automatically. Radios used in transceivers operate in four different modes: Transmit Receive, Idle, and Sleep. Radios operating in Idle mode results in power consumption, almost equal to power consumed in Receive mode. Thus it is better to completely shutdown the radios rather than in the Idle mode when it is not Transmitting or Receiving. And also significant amount of power is consumed when switching from Sleep mode to Transmit mode to transmit a packet.

Sensing Unit

It senses the environment through transceiver.

External Memory

From an energy perspective, the most relevant kinds of memory are on-chip memory of a microcontroller and FLASH memory - off-chip RAM is rarely if ever used. Flash memories are used due to its cost and storage capacity. Memory requirements are very much application dependent. Two categories of memory based on the purpose of storage

- User memory used for storing application related or personal data.
- Program memory used for programming the device.

Power Source

Power consumption in the sensor node is for Sensing, Communication and Data Processing. More energy is required for data communication in sensor node. Energy expenditure is less for sensing and data processing. The energy cost of transmitting 1 Kb for distance of 100 m is approximately the same as that for the executing 3 million instructions by 100 million instructions per second/W processor. Power is stored either in Batteries or Capacitors. Batteries are the main source of power supply for sensor nodes. Namely two types of batteries used are chargeable and non-rechargeable. They are also classified according to electrochemical material used for electrode such as NiCd (nickel-cadmium), NiZn(nickel-zinc), Nimh (nickel metal hydride), and Lithium-Ion. Current sensors are developed which are able to renew their energy from solar, thermogenerator, or vibration energy. Two major power saving policies used are Dynamic Power Management (DPM) and Dynamic Voltage Scaling (DVS). DPM takes care of shutting down parts of sensor node which are not currently used or active. DVS scheme varies

the power levels depending on the non-deterministic workload. By varying the voltage along with the frequency, it is possible to obtain quadratic reduction in power consumption.

CONCLUSION

This paper can be very useful for a newbie in the field of WSN. In this paper, I have tried out best to cover WSN, WSN applications fully but a more detailed description can be there for each security component in future. The future is very dynamic for wireless sensor network due to large demand of WSN for various application and both hardware and software fields are wide opened for it.

WSN are used to collect data from the environment. They consist of large number of sensor nodes and one or more Base Stations. The nodes in the network are connected via Wireless communication channels. Each node has capability to sense data, process the data and send it to rest of the nodes or to Base Station. These networks are limited by the node battery lifetime.

The cost of sensor nodes is similarly variable, ranging from a few to hundreds of dollars, depending on the complexity of the individual sensor nodes. Size and cost constraints on sensor nodes result in corresponding constraints on resources such as energy, memory, computational speed and communications bandwidth. The topology of the WSNs can vary from a simple star network to an advanced multi-hop wireless mesh network.

REFERENCES

1) Navreetinder Kaur et al, “A review of wireless sensor network with its applications”. (IJCSIT) International journal of Computer Science and Information Technologies, Vol. 7(i), 2016, 211-214.
2) Sudha et al, “A Survey on wireless sensor network”. (IJESRT) International Journal of Engineering Science of Research Technology, Vol 6(9) Sept, 2017.
3) L.M.L. Oliveira, J.J.P.C. Rodrigues, “Wireless Sensor Networks: Survey on environmental monitoring.” Journal of communications, Vol – 6, No – 02, PP: (143-151) 2011.
4) Xiaochen Lai, Quanli Liu, Xin Wei, Wei Wang, Guoqiao zhou and Guangyi Han “A survey of wireless sensor networds” sensors 2013, 13, PP: 5406-5477
5) P. usha, N. priya, “Survey on wireless sensor network” published in International Journal of advanced research in Computer Science and Software Engineering Volume 5, issue I, PP: 482-485, January 2015.
6) https://en.wikipedia.Org/wiki/wireless-sensor network.

7) Nitya, Pushpam, Maninder Kaur, "An advanced wireless sensor network for health monitoring". International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol – 2, Issue 2, PP: 882 – 887, February 2013.

8) Ai – Karaki, J.N. ; Kamala, "Wireless sensor network survey", Wireless communications, International Conference, Vol.II, No-6, PP-6-28,2004.

9) Y.R.V. Prasad, M.S. Baig, R.K. Mishra, P. Rajalakshmi, V.B. Desai, S.N. Merchant, "Real time wireless air pollution monitoring system," ICTACT Journal on Communication Technology: Special Issue on next Generation wireless networks and applications, Vol – 02, Issue 2, PP: 370 – 375, June 2011.

10) Junguo Zhang, Wenkin L, Ning Han, Jiangming Kan, "Forest fire detection system based on a aig bee wireless sensor network, " Higher education press and springer – verlag, Vol – 3, issue 3, 2008, PP: 369-374.

11) A.J Whittle, M. Allen, A pris, M. Iqbal, "Sensor networks for monitoring and control of water distribution systems, "proceedings of the 6th international conference on structural health, Monitoring of intelligent infrastructure, Hong Kong, 9-11 December, 2013.

1) A.N. Das, D.O. Papa, P. Ballal, F.L. Lewis, "Data logging and supervisory control in wireless sensor networks, "International Journal of Sensor Networks vol.6, Issue I, PP: 13-27, January 2009.

2) "A secure wireless sensor networks" Published in Journal of Software, vol. 9, No – 8 PP: 2043 – 2049, August 2014.

3) Ankur Hooda, Sonia Sharma, Anima "A Security and Issues" published in International Journal of Electronics, Communication & Instrumentation Engineering Research and Development, Vol. – 3, Issue – I, PP: 203-210, Mar 2013.

भारतीय भाषा, शिक्षा, साहित्य एवं शोध

ISSN 2321 – 9726

WWW.BHARTIYASHODH.COM

INTERNATIONAL RESEARCH JOURNAL OF MANAGEMENT SCIENCE & TECHNOLOGY

ISSN – 2250 – 1959 (0) 2348 – 9367 (P)

WWW.IRJMST.COM

INTERNATIONAL RESEARCH JOURNAL OF COMMERCE, ARTS AND SCIENCE

ISSN 2319 – 9202

WWW.CASIRJ.COM

INTERNATIONAL RESEARCH JOURNAL OF MANAGEMENT SOCIOLOGY & HUMANITIES

ISSN 2277 – 9809 (0) 2348 - 9359 (P)

WWW.IRJMSH.COM

INTERNATIONAL RESEARCH JOURNAL OF SCIENCE ENGINEERING AND TECHNOLOGY

ISSN 2454-3195 (online)

WWW.RJSET.COM

INTEGRATED RESEARCH JOURNAL OF MANAGEMENT, SCIENCE AND INNOVATION

ISSN 2582-5445

WWW.IRJMSI.COM

JOURNAL OF LEGAL STUDIES,POLITICS AND ECONOMICS RESEARCH

WWW.JLPER.COM