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# ANALYSIS OF WIRELESS SENSOR NETWORK APPLICATION SERVICES

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## ABSTRACT

The basic parts of sensor nodes, the technology used with the wireless sensor network have been explained. This is followed by the advantages, applications and challenges of wireless sensor network. The applications provide some key attributes that determines the driving force behind WSN research. As the cost and size of sensor devices are decreasing fast, the application areas of wireless sensor networks have also expanded rapidly. The major application domains are home and office, control and automation, logistics and transportation, environmental monitoring, healthcare, security and surveillance, tourism and leisure, education and training and entertainment. Typical possible application scenarios may include digitally equipped homes, manufacturing process monitoring, vehicle tracking and detection, and monitoring inventory control.

There are many challenges but due to the scarce energy resources of sensors, energy efficiency is one of the main challenges in the design of protocols for WSNs. The ultimate objective behind the design is to keep the sensors life time as long as possible.

***Keywords-*** *Wireless Sensor Networks, design , application area, performance measurement .*

## 1. INTRODUCTION

**1.1 WSN is an emerging technology that can be deployed in such situation where human**

Interaction is not possible like border area tracking enemy moment or fire detection system. Figure 1 shows an overview

of WSN. Sensor are deployed in the environment which can be fire area, border or open environment. These tiny devices sense the area of interest and then communicate with Base Station (BS). On BS the gathered information is analyzed. Mainly a sensor node is composed of five components including [1]:

a. Sensing Hardware
b. Processor
c. Memory
d. Power supply
e. Transceiver

**1.2 A sensor network faces different challenges and constraints according to the environment in the sensor network as discussed by Jennifer.**

a. Mobile Wireless Sensor Network
b. Multimedia Wireless Sensor Network.
c. Terrestrial Wireless Sensor Network.
d. Underground Wireless Sensor Network.
e. Under Water Wireless Sensor Network.

**1.3 Types of Wireless Networks are Defined on the Bases of their Size, Range and Speed of Data Transfer**

a. Wireless Personal area Network Interconnected Devices in Small Premises. Example Invisible Infra Red Light and Bluetooth Radio Interconnects a Headphone to a Laptop By the Virtue of WPAN[2]
b. Wireless Local area Network
c. Simplest Wireless Distribution Method That is used for interlinking two or More Devices, Spread Spectrum
d. Technology Give Client Freedom to Move within a Local Coverage Area.

**1.4 Wireless Metropolitan Area Network**

Connect at High Speed Multiple Wirelesses LAN That Are Geographically Close, The Set Up Makes Use of Routers Or Switches For Connecting With High Speed Links Such as Fiber Optic Cable.

a. WiMax Described as 802.16 Standard by the IEEE is A Type of WMAN Wireless Mobile Devices Network
b. The Advent of Smart Phones Have addes A New Dimension in Telecommunication. Today Telephone are NT Meant to Converse only to Carry Data

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c. Personal Communication Service –Pcs Is Radio Band That Is Employed In South Asia And North America The First Pcs Service Was Triggered Sprint
d. Tiny Area Network-Tiny Area Network Some Time Called Campus Area Network Is Provide Band width,Tan Working Is Like Lan But Comparatively Smaller
e. Wired Equivalent Privacy – As Well Asfirewall Could Be Used For Securing The Network

Wireless Network Are The Future Of Global Village Sensor Network Referring To Security Of Wire Less Lan Network.

## 2. RELATED WORK

### 2.1 WIRELESS SENSOR AREA NETWORK AND ITS WORK

Types of wireless networks are defined on the bases of their **Size, Range** and the **Speed** of **Data Transfer:-**

### 2.2 WIRELES – PERSONAL AREA NETWORK

Interconnected Devices in Small Premises Example Invisible Infra Red Light and Bluetooth Radio Interconnects a Headphone to a Laptop by the Virtue of WPAN

### 2.3. WIRELESS LOCAL AREA NETWORK

Simplest Wireless Distribution Method that is Used for Interlinking Two or More Devices, Spread Spectrum Technology give Client Freedom to Move Within a Local Coverage Area.

### 2.4. WIRELESS METROPOLITAN AREA NETWORK

**(A)** Connect at High Speed Multiple Wireless LAN That are Geographically Close.
**(B)** The Set Up Makes Use Of Routers Or Switches For Connecting With High Speed Links Such As Fiber Optic Cable.
**(C)** WiMax Described as 802.16 Standard by the IEEE is a type of WMAN

### 2.5. WIRELESS MOBILE DEVICES NETWORK

**(A)** Today Telephone are Nt Meant To Converse Only To Carry Data.
**(B)** The Advent Of Smart Phones Have Adds A New Dimension In Telecommunication.

### 2.6 PERSONAL COMMUNICATION SERVICE –

**(A)** PCS is Radio Band That Is Employed in South Asia and North America.
**(B)** The First PCS Service Was Triggered Sprint

### 2.7 TINY AREA NETWORK-TINY AREA NETWORK

**(A)** Some Time Called Campus Area Network, it provide Bandwidth, TINY AREA NETWORK working is like LAN but comparatively smaller**.**

### 2.8. WIRED EQUIVALENT PRIVACY –

**(A)** As Well As firewall could be Used For Securing the Network.
**(B)** Wireless Network is the Future of Global Village Sensor Network Referring To Security of Wire less LAN Network.

## 3. THE MAJOR ISSUES THAT AFFECT THE DESIGN AND PERFORMANCE OF A WIRELESS SENSOR NETWORK

(1) Hardware and Operating System for WSN
(2) Wireless Radio Communication Characteristics
(3) Medium Access Schemes
(4) Deployment
(5) Localization
(6) Synchronization
(7) Calibration

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(8) Network Layer
(9) Transport Layer
(10) Data Aggregation and Data Dissemination
(11) Database Centric and Querying
(12) Architecture
(13) Programming Models for Sensor Networks
(14) Middleware
(15) Quality of Service

## 4. DEVELOPEMENT OF SUCH ROUTING TECHNIQUE THAT

1. Suitable for large network size.
2. Performs adaptive routing.
3. Is better than traditional routing techniques.
4. Is energy efficient.
5. Prolongs the network lifetime.

## 5. NETWORK DESIGN OBJECTIVES

Most sensor networks are application specific and have different application requirements. Thus, all or part of the following main design objectives is considered in the design of sensor networks [7]:

**A. Small node size:** Since sensor nodes are usually deployed in a harsh or hostile environment in large numbers, reducing node size can facilitate node deployment. It will also reduce the power consumption and cost of sensor nodes.

**B. Low node cost:** Since sensor nodes are usually deployed in a harsh or hostile environment in Large numbers and cannot be reused, reducing cost of sensor nodes is important and will result into the cost reduction of whole network [8].

**C. Low power consumption:** Since sensor nodes are powered by battery and it is often very difficult or even impossible to charge or recharge their batteries, it is crucial to reduce the power consumption of sensor nodes so that the lifetime of the sensor nodes, as well as the whole network is prolonged.

**D. Scalability:** Since the number sensor nodes in sensor networks are in the order of tens, hundreds, or thousands, network protocols designed for sensor networks should be scalable to different network sizes [9].

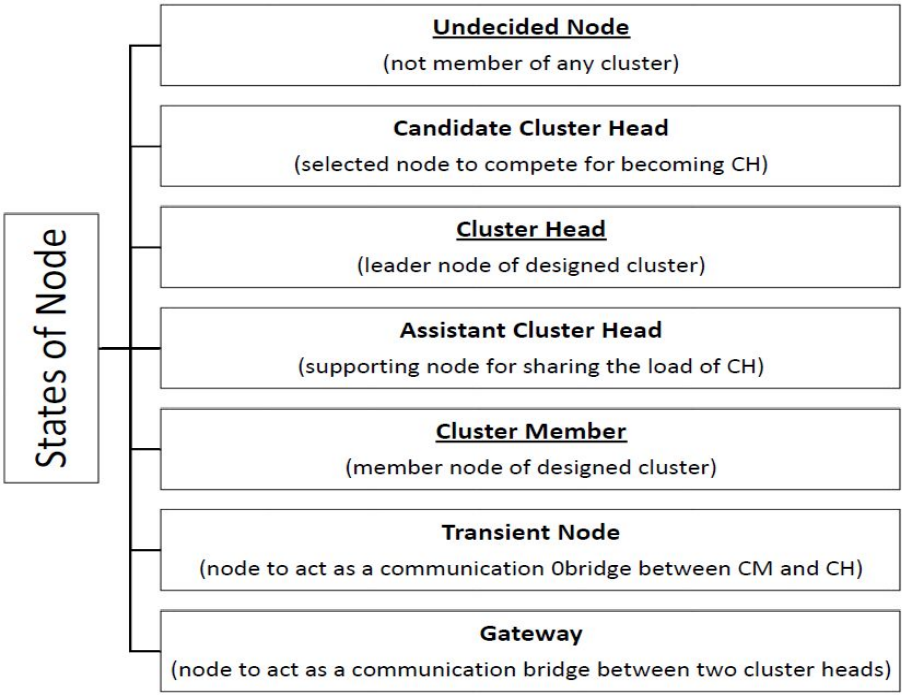

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Fig1.2 The various roles of nodes during their lifetime in a clustered network architecture.

**E. Reliability:** Network protocols designed for sensor networks must provide error control and correction mechanisms to ensure reliable data delivery over noisy, error-prone, and time-varying wireless channels[10].

**F. Self-configurability:** In sensor networks, once deployed, sensor nodes should be able to Autonomously organize themselves into a communication network and reconfigure their Connectivity in the event of topology changes and node failures.

**G. Adaptability:** In sensor networks, a node may fail, join, or move, which would result in changes in node density and network topology. Thus, network protocols designed for sensor networks should be adaptive to such density and topology changes [11].

**H. Channel utilization:** Since sensor networks have limited bandwidth resources, communication protocols designed for sensor networks should efficiently make use of the bandwidth to improve channel utilization.

**I. Fault tolerance:** Sensor nodes are prone to failures due to harsh deployment environments and unattended operations. Thus, sensor nodes should be fault tolerant and have the abilities of self testing, self-calibrating, self-repairing, and self-recovering [12].

**J. Security:** A sensor network should introduce effective security mechanisms to prevent the data information in the network or a sensor node from unauthorized access or malicious attacks.

**K. QoS support:** In sensor networks, different applications may have different quality-of-service (QoS) requirements in terms of delivery latency and packet loss. Thus, network protocol design should consider the QoS requirements of specific applications [13].

## 6. AN ABSTRACT VIEW OF A COMPARATIVE ANALYSIS OF CLUSTRING ALGORITHMS ON VARIOUS NETWORK DEIGN AND OPERATIONALS PARAMETERS

A brief description of parameters used in this table is given below [14].

A. **Node Type**

Type of deployed nodes according to their configuration.

- Homogeneous: all the network nodes have the same configuration (energy, processing power, etc.)
- Heterogeneous*:* Nodes in the network have different configurations (energy, transmission range, antenna gain, processing power, *etc.*).

**A. Communication to Sink**

- On data collection at the CH, a communication style is chosen to let it reach the BS either through
- Direct communication or through multi-hop communication.
- Multi Hop: CH communicates the data to BS through some transient node (CH, or gateway node).
- Direct Hop: CH communicates the data to BS without using any transient node.

**B. Inter-Cluster Communication Style**

- Communication of data between adjacent clusters for further transmitting it to a BS.
- CH—CH: CH communicates the data to its next CH.
- CH either transmits the data directly to BS or the authors do not mention this routing
- aspect in the paper at all. Another possibility exists, i.e., a CH does not communicate the data
- The next CH but rather it is a gateway node that is selected to transmit the data directly to a BS.

**C. Intra-Cluster Communication Style**

- Cluster member node communicates the data to CH either directly or indirectly [15].
- Direct: a CM node communicates sensed or collected data to a CH without using any transient node.
- Multi Hop: a CM node communicates sensed or collected data to a CH thorough some transient node.
- the authors don't discuss intra-cluster communication style in their paper.

**D. Cluster Size**

- Size of cluster in network with respect to number of CM nodes.

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- Equal: No. of CM nodes in network clusters are almost same.
- Unequal: No. of CM nodes in network clusters is variable enough to make their size very Different from each other.

**E. Cluster Design**

- The process of grouping network nodes in clusters is based on some defined parameter.
- Centralized: The process of cluster design is controlled directly from a BS.
- Distributed: The process of cluster design is distributed. Nodes communicate with each other to do this Process.

**F. Suitability to Network Size**

- Size of network with respect to deployment area for which the algorithm works efficiently.
- Small: Network nodes communicate directly to the BS without any transient node.
- Large: Network nodes communicate indirectly to the BS through a number of transient nodes.
- Medium: Network nodes communicate indirectly to a BS through one transient node.

**G. CH Election Criteria**

- A node elected to head the activities of a cluster is called CH. This election is based on some election parameter.
- Election Parameter: the CH is elected based on residual node energy, position of the node, or based on
- some calculation like ratio of average residual energy of neighbor nodes and residual energy of the node itself [16].

**H. Power Adjustment**

- Transmission power of node adjustment for communicating its data to destination node.
- Static: Nodes' transmission power remains same i.e. it is neither increased nor decreased.
- Dynamic: Nodes' either increase or decrease their transmission power according to the interaction situation.

**I. CH Rotation**

- Role of CH is transferred to a suitable node based on some selection parameter.
- Rotation Parameter: CH rotation is performed either on each round, or on a decrease of some node characteristic.

## 7. RESULT

Sensor network lifetime depends on the number of active nodes and connectivity of the network, so energy must be used efficiently in order to maximize the network lifetime. Performance studies provide valuable information for developing tools and solutions to improve system performance. Critical factors that influence system performance include scalability, communication, protocols at different layers, failures, and network management.

We describe an energy-efficient multi-hop routing protocol using gateway node to minimize energy consumption of sensor network [17]. In this work, we divide the network into logical regions. Each region use different communication hierarchy. Two regions use direct communication topology and two regions are further sub-divided into clusters and use multi-hop communication hierarchy. Each node in a region elects itself as a CH independent of other region. This technique encourages better distribution of CHs in the network. Simulation results that our proposed protocol performs well compared to LEACH. In this work, we study the three performance metrics: Network lifetime, Residual energy and throughput. In future, we will study ETX link metrics and we will implement this metric in our scheme as implemented and demonstrated.

## 8. CONCLUSION

In this paper, various applications of WSN along with the knowledge of security issues & attacks of WSN are discussed. This paper can be helpful for research scholars who are working in this field. Security is an important requirement and complicates enough to set up in different domains of WSN. Adding security in a resource constrained wireless sensor network with minimum overhead provides significant challenges, and is an ongoing area of research. There is currently enormous research potential in the field of WSN.

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## 9. ADVANTAGES

**9.1 Advantages of WSNs over traditional methods are:**

A. Wide coverage

B. Long monitoring periods

C. No individual tracking

D. Data available directly to researcher's location

E. Land and Aquatic Coverage

F. Continuous monitoring

**9.2 Advantages of WSNs over modern methods are**:

A. Area monitoring applications

B. Environmental applications

C. Health applications

D. Industrial applications

E. Disaster Management

F. Commercial Applications

I. Medical Applications

J. Environment Observation

K. Military Applications

## 10. FUTURE WORK

Performance parameters given below. A study the three performance metrics: Network lifetime, Residual energy and throughput.
[1] Our proposed protocol Performance analysis and compared results performs well compared to Low Energy Adaptive Clustering Hierarchy.

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