Routing Protocols in Wireless Sensor Network: A Comprehensive Study

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Abstract- In this paper there is a literature review on WSN network , in it the capacity of network nodes constrained as for energy supply, confined computational limit and correspondence communication bandwidth.WSN is a developing technology for attraction of researchers with its examination challenges and different application areas.To ensure reliable multi-hop communication , to maintain the routes in the network the Routing protocols for WSN are responsible.

Keywords- Routing Protocols, Wireless sensor networks(WSN), DSN.

INTRODUCTION

Recently, in the size of network WSN has developed into a good concept of leading field of experimentation. Wireless sensor network (WSN) is assume an crucial class of ad hoc network which is constitute of interdependent self-governing nodes for track environmental mode such as heat and sound etc and leading the assemble abstract from nodes to the central Station by a wireless intercommunication means and forming a network. Wireless sensor network quickly turn out to be most prominent and promising technology for enabling an variety of uses like environmental monitoring, security, and application that save our lives and assets. Wireless sensor network is utilized to distinguish a variety of interest is measured information; its primary object is to test information to acquire the detection area including devices cellular phone, mobiles, laptops and personal digital assistants DARPA additionally worked the Distributed Sensor Networks (DSN) program in the mid 1980s, which was then trailed by the Sensor Information Technology (SensIT) program[10]. For example, Figure 1. demonstrates two sensor fields observing two distinctive geographic regions and interfacing with the Internet utilizing their base stations.
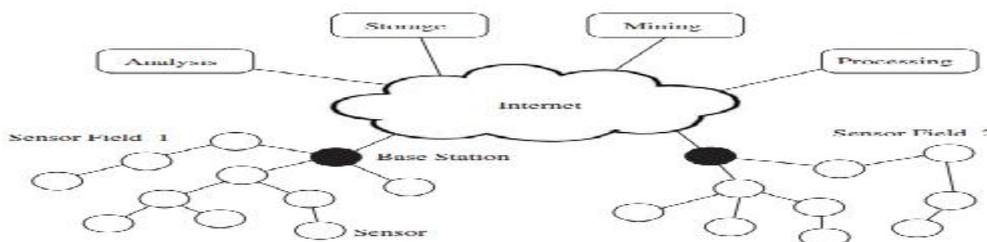

Fig. 1. Wireless sensor networks[10].
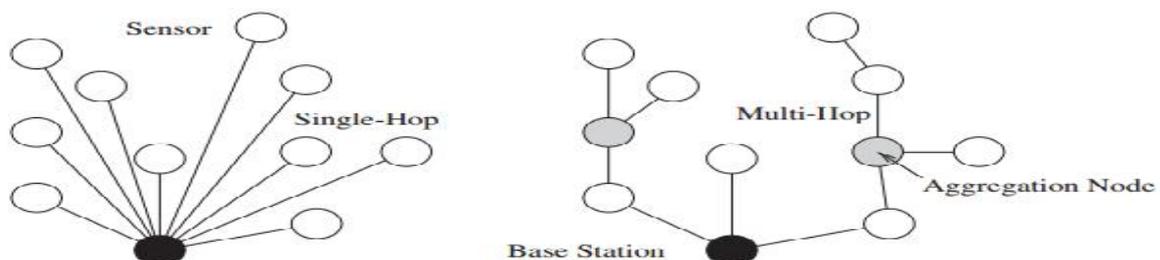
COMMUNICATION IN A WSN

Fig. 2. Single-hop versus multi-hop communication in sensor networks[10].

OBJECTIVE

The main goal of a wireless sensor network is to sense and collect data from a certain domain, process them and transmit it to the sink where the application lies.

DESIGN ISSUES OF A WSN

Wireless Sensor Network Design issues are mentioned and diverse possible platforms for simulation and testing of routing protocols for WSNs are examined in below[5,9]:

DESIGN ISSUES OF A WIRELESS SENSOR NETWORK						
Fault Tolerance	Scalability	Production Costs	Hardware Constraints	Sensor Network Topology	Transmission Media	Power Consumption.

TABLE 1. DESIGN ISSUES OF A WSN

STRUCTURE OF A WSN

Structure of a Wireless Sensor Network includes diverse topologies for radio communications networks[11]. A short talk of the network topologies that apply to WSN are shown in fig.3.
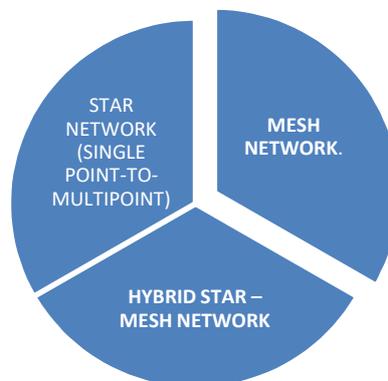

Fig. 3. Structure of A WSN

STRUCTURE OF A WIRELESS SENSOR NODE

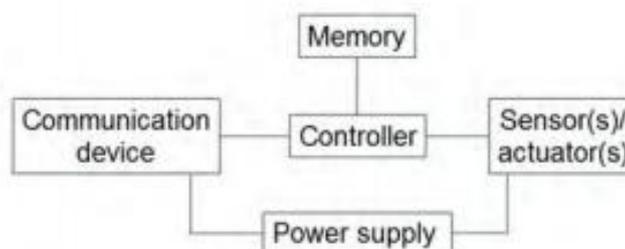Sensing node two subunits: sensors and analogue to digital converters (ADCs) [5].

Fig. 4. Components of a node of a WSN[4].
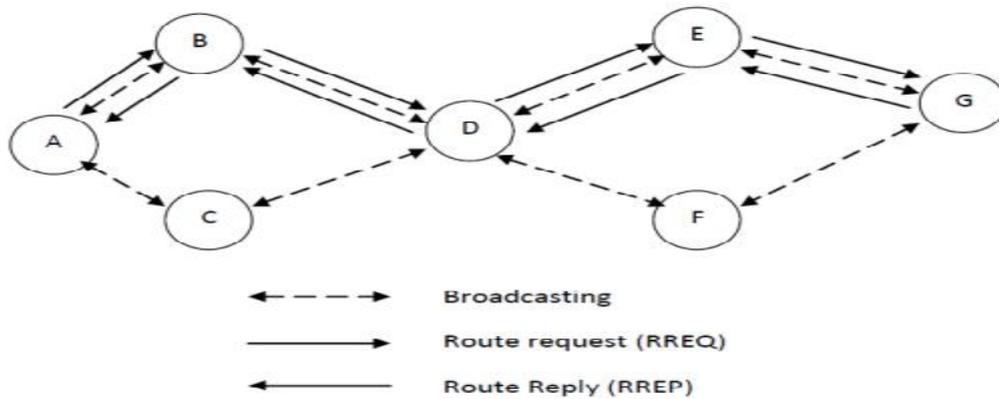
WORKING OF ROUTING PROTOCOL

Figure 5. Working of Routing Protocol[7]

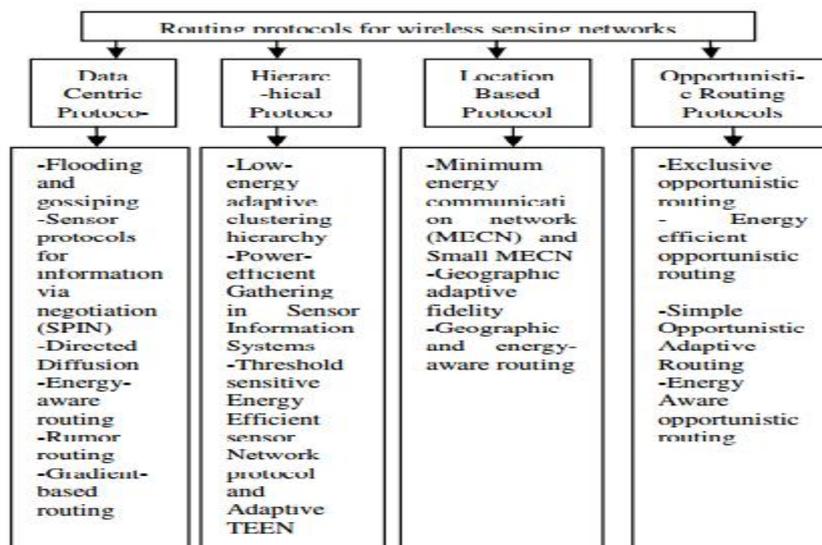## CLASSIFICATION OF ROUTING PROTOCOLS

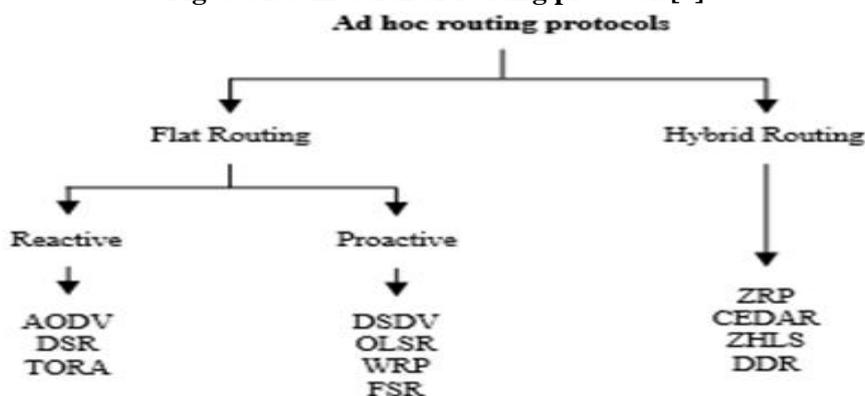Fig. 6 Classification of routing protocols[8].

Fig. 7 Classification of Ad hoc routing protocols

a) **Proactive Routing Protocols:** This kind of protocol maintains and keeps up to date routing information between each pair of nodes by using sending control message periodically in community. Example are DSR, AODV, TORA and LMR etc..

Table 2:- Proactive Routing Protocol

SR NO.	PROACTIVE ROUTING PROTOCOL
1.	OLSR-optimal link state routing protocol
2.	DSDV-Destination sequence distance vector
3.	WRP-Wireless routing protocol
4.	GSR-Global state routing
5.	FSR-Fisheye state routing
6.	STAR-Source tree adaptive routing protocol etc.

b) **Reactive Routing Protocols:** Reactive routing protocols [3] had been designed to lessen overheads found in proactive protocols via maintaining statistics.

Table 3:-Reactive Routing Protocol

SR NO.	REACTIVE ROUTING PROTOCOL
1.	DSR-Dynamic surce routing protocol
2.	TORA-Temporally ordered routing protocol
3.	LAR-Location-aided routing
4.	ABR-Associativity-based routing
5.	LMR-Light-weight mobile routing

(a)Ad hoc On-Demand Distance Vector Routing Protocol (AODV):-

It is basically work on-call access .It doesn't support alternate change of routing message. In this classification of protocol neighbor nodes keep the route information or message of its further hop neighbor only. It based on two applications which are route analysis, allowance and call of step by step routing and sequence number or cache. Routing counter contain the information regarding succeeding hop to end .To create a communication in between node, this protocol nodes are call four class of information. In Ad-hoc network for route analysis "Route Reply (RREP) and Route Request (RREQ)" messages are performed with in the network. HELLO message and RERR messages are applicable for path allowance. Route analysis is performed when node telecast RREQ to the neighbor only. To compose this routing freebie and classify maximum refresh path then in this end sequence cache is mostly call. Reply packet (RREQ) are performed when neighbor having any route otherwise it governing request packet to neighbor.

(b)Dynamic Source Routing protocol:-

In WSN, DSR is composite of two modes to allow the discovery and allowance of source way.

1. Route Discovery: - In this mode source node accomplish route with address the packet from originator to end. Route analysis is done when the originator nodes effort to address a packet to end and it doesn't earlier inform a track to that end.

2. Route allowance: - In this Mode if network topology replaced when a node to travel a message to end is fitted to catch, while using a source route to the end. If the case that link forth the route broken then it must no continued use this route to the end. When the originator node is actually precede packets or file to the end or destination then route allowance is performed with in the network.

c) **Hybrid Routing Protocols**: Hybrid protocols are the combination of reactive as well as proactive routing protocols. ZRP, BGP, EIGRP are the example of Hybrid routing protocols[2].

Table 4:-Hybrid Routing Protocol

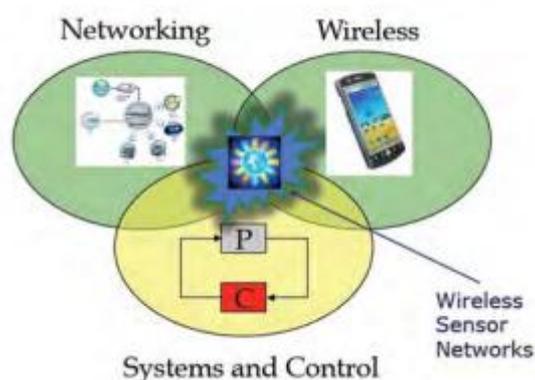| SR NO.	HYBRID ROUTING PROTOCOL
1.	ZHLS-Zone-based hierarchical link state
2.	SLURP-Scalable location update routing protocol
3.	ZRP-Zone routing protocol
4.	DDR-Distributed dynamic routing

WSN ARCHITECTURE AND PROTOCOL STACK

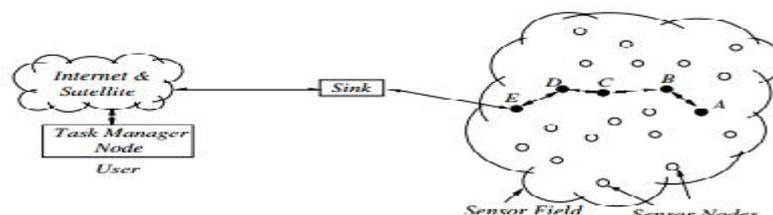**Fig. 8. Areas of study that concur to the definition of WSNs[4]**

Fig. 9. A WSN connected to the Internet via a sink node[4].

In WSNs, data originators and data routers both are sensor nodes have actual the double usefulness. Thus, communication is performed for two reasons[4]:

〕 **Source function:** Each sensor node's assemble data from the environment through the different sensors. The data produced from sensing the environment should be prepared and transmitted to close-by sensor nodes for multi-bounce delivery to the sink.

〕 Router function:In addition to beginning data, every sensor node is responsible for relaying the data transmitted by its neighbors. As needs be, the sensor node is in responsible of getting the data sent by its neighbors and sending these data to one of its neighbors as per the routing decisions.

WSN APPLICATIONS[4]

〕 Military or Border Surveillance Applications
〕 Environmental Applications
〕 Health Care Applications
〕 Home Intelligence

∫   Agriculture.

CHARACTERISTICS OF WSN

∫   Dynamic network
∫   Huge data flow
∫   Low power consumption
∫   Limited computing and storage capabilities.

WSN INTEGRATION WITH THE INTERNET

The evolution of wireless technology research explore has advanced in each of these areas independently, yet acknowledgment of these networks will require tight integration and interoperability. Toward this direction, the 6LoWPAN standard has been created to coordinate the IPv6 standard with low-power sensor nodes[1].In most sensor arrangement situations, the sink is normally accepted to reside inside or exceptionally close to the sensor field, which makes it a player in the multi-hop communication in getting the sensor readings[1]. It is desirable to have the capacity to achieve the sensor network from a distant monitoring or management node residing in the wireless Internet.

SIMULATION SETUP

The network scenario has been composed and actualized utilizing Network Simulator NS2.34 and furthermore done by testbed, Qualnet 7.1 , certifiable examinations or simulation. Since simulation is less expensive and practical so most research work of ad hoc networks is directed utilizing simulation software.It eliminates with the requirement for consuming and costly real world experiments[6].It helps to compare the performance of AODV, STAR and ZRP in various simulation environments. The examination was made by varying the node density and the simulation environment each one in turn and keeping every one of the components to be steady. Three conditions were considered are, i.e., static, dynamic and random.

CONCLUSION AND FUTURE WORK

The aim of this paper is to discuss some issues of WSNs, from the application, design and technology. WSN applications help both civilian and militarypeople. Most commonly challenge is to design an efficient routing strategy. A routing protocol should be energy efficient, load balancing, fault tolerant, scalable and should provide high level of security but still it is a challenging task. Many routing protocol have been developed for use in sensor network but most of them do not meet conditions of performance metric. Some important related research that may be carried out in future includes design routing protocols with managed duty cycled nodes. Actual design should concentrate on three-dimensional sensor fields. Energy constraint issue should also be considered for a longer lifetime..

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