International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE)
Volume 3, Issue 10, October 2014

Design and analysis of an improved AODV Routing Protocol for Wireless Sensor Networks and OPNET

T.Rajesh[1] , Prof. V.S.R.Kumari[2]

Abstract:

The world attracted to wireless communication day by day because of its lower power consumption, rapid topology, good real-time, scalability, low cost and continent deploy. Presently, both Wireless Wide Area Network and Wireless Personal Area Network has been given a lot of concern and research. WSN has been widely used on military defence, anti-terrorism, health and environmental monitoring, and it has improved the connection between human, machine and environment to a new level Wireless Sensor Network integrated the wireless communication technique, sensor technology and computer technology, is the foundation of "The Internet of things" and tops the list of ten technology which has profound impact on human future life.. Obviously, all these application need the WSN to be lower power consumption, rapid topology, good as a real-time and so on. Above all, low power consumption bears the brunt. In order to improve the performance of the network and increase the lifetime of the network, we need to lower the power consumption of sensor node in the wireless sensor network. In this paper, an improved AODV routing protocol based on minimal route cost is presented, and OPNET is used to simulate the throughput, end-to-end delay and other parameters for evaluating the performance of the wireless sensor network with the improved protocol, the simulated results show the validation of the presented improved protocol.

I.INTRODUCTION

The advancements in wireless communication technologies enabled large scale wireless sensor Networks (WSNs) deployment .Due to the feature of ease of deployment of sensor nodes, wireless Sensor networks have a vast range of applications such as monitoring of environment and Rescue missions Wireless sensor network is composed of large number of sensor nodes[2]. The event is sensed by the low power sensor node deployed in neighborhood and the sensed Information is transmitted to a remote processing unit or base station.To deliver crucial information from the environment In real time it is impossible with wired sensor networks whereas wireless sensor networks used for data Collection and processing in real time from environment[3].

T.Rajesh *[1]M.Tech student, SMCE,Tummalapalem,Guntur,*
Prof. V.S.R.Kumari *[2]HOD ECE, SMCE, Tummalapalem,Guntur.*

The ambient conditions in the environment are Measured by sensor the are processed in order to assess the situation accurately in area around the sensor. Over a large geographical area large numbers of sensor nodes are deployed for accurate monitoring. Due to the limited radio range of the sensor nodes the increase in network size increases coverage of Area but data transmission i.e.to the base station (BS) is made possible with the help of intermediate Nodes[6].Depending on the different applications of wireless sensor networks they are either deployed manually or randomly. After being deployed either in a manual or random fashion, the sensor Nodes self-organizes them and start communication by sending the sensed data. These Sensor networks are deployed at a great pace in the current world Access to wireless sensor networks through internet is expected within 10-15 years. There is an Interesting unlimited potential in this wireless technology with various application areas along With crisis management transportation, military, medical, Natural disaster, seismic sensing and Environmental. There are two main applications of wireless sensor Networks which can be categorized as: monitoring and tracking[7]. In general the two types of wireless sensor Networks are: unstructured and structured. The structured wireless sensor networks are those in which the Sensor nodes deployment is in a planned manner whereas unstructured wireless sensor networks are the one In which sensor nodes deployment is in an ad-hoc manner. As there is no fixed infrastructure between Wireless sensor networks. Communication routing becomes an issue in large number of sensor nodes Deployed along with other challenges manufacturing design and management of these networks. There are different protocols that have been proposed for these issues. The critical condition Monitoring application is studied in this work by evaluation of two routing protocols with the Help of some performance metrics considering applications demand as well[9].

ISSN: 2278 – 909X All Rights Reserved © 2014 IJARECE

A. **Methodology:**

Following are the steps which were performed to achieve the objectives of this thesis work.

B. Review:

In this step any published work or surveying of the literature of the research work done relevant about the study area is gathered for assessment.

C. WSN Architecture:

In this step the required background information for the understanding of the subject of this thesis Work is provided. Also a general understanding of the new emerging technologies from the wireless communication point of view is given in this step. It is simple to start with MANETs which are the base of WSN for the understanding of WSN[25].

D. Functionality of Routing Protocols:

The explanation of the main characteristics and differences of the routing protocols and how they work for WSNs are presented in this step. This step includes how Selection of the path. Control messages etc[27].

E. Simulation Tool:

OPNET modeler software is used in this study. OPNET is a useful tool in Research. The use of OPNET can be broken down into four major steps. Creation of nodes (modeling) is the first step. After modeling choose statistics, execute simulations and finally view results[35].

F. Simulation:

After detail discussion of routing protocols for WSN and necessary implementations, in the next step Preparation of model for each routing protocol and analyzing its effect for critical condition monitoring application with the help of different parameters is done. These parameters are average end-to-end delay and throughput[35].

G. Goal:

The main goal of this work is the study, selection and evaluation of routing protocols from the existing one for wireless sensor network and compares the performance of these routing protocols for Monitoring application of critical condition. The particular goals of this work are to:Develop and design a simulation model. Perform a simulation with different metrics. Analysis of the results. Deriving a conclusion on basis of performance evaluation.

H. Related work:

In an evaluation of three routing protocols of WSN namely probabilistic geographic routing Protocol (PGR), beacon vector, routing protocol (BVR) and flooding protocol (FP) using Prowler simulator to determine which one is efficient for scalability through several metrics Which are throughput, latency, energy consumption and delay, it was concluded that BVR is Most efficient for scalability[1]. AODV, a reactive routing protocol performance is improved by fixing expiry time and analyzing it in Quall net. On basis of results derived from simulation the Shortest routing path is ensured based on IEEE 802.11 and IEEE 802.15.4. This routing protocol is Good in case of wireless sensor networks because of frequent movement. The differences in AODV, CBRP, PAODV, DSDV and DSR routing protocols is presented by comparing the size of ad hoc networks, load and mobility. The authors concluded that AODV shows the shortest end-to-end delay and throughput in DSR and CBRP is very high. Routing overhead in DSR is higher than CBRP instead of less number of route request packets While largest overhead is shown by AODV. The original AODV routing protocol is Out performed by preemptive routing protocol[27]. In another research, comparison of TORA, DSR, FSR and AODV routing protocols is analyzed. In comparison of these routing protocols, an important Observation was that TORA was not good choice for vehicular environments, AODV and FSR Showed good results in city scenario High end-to-end delays were shown by Drain comparison of DSDV and AODV routing protocols, it was concluded that AODV performs better than DSDV in Terms of bandwidth as AODV do not contain routing tables so it has less overhead and consume less bandwidth while DSDV consumes more bandwidth[33]. Location Aided Routing (LAR1), DSR and AODV, the three on demand protocols for ad hoc networks were compared and following observations made were that LAR1 for high density performed well and show good results in energy consumption in large networks whereas in case of low scale networks DSR shows better energy consumption than others.

ISSN: 2278 – 909X All Rights Reserved © 2014 IJARECE

II. WIRLESS SENSOR NETWORK

A. Introduction:

Wireless sensor networks are composed of independent sensor nodes deployed in an area Working Collectively in order to monitor different environmental and physical conditions such as motion, Temperature, pressure, vibration sound or pollutants[12]. The main reason in the advancement of wireless sensor network was military applications in battlefields in the beginning but now the application area is extended to other fields including industrial monitoring. Controlling of traffic and health monitoring Different constraints such as size and cost results in constraints of energy, bandwidth, memory and computational speed of sensor nodes.
A wireless sensor node in a network consists of the following components: Microcontroller. Radio transceiver. Energy source (battery).WSN have the following distinctive characteristics:
They can be deployed on large scale. These networks are scalable; the only limitation is the bandwidth of gateway node. Wireless sensor networks have the ability to deal with node failures. Another unique feature is the mobility of nodes. They have the ability to survive in different environmental surroundings. They have dynamic network topology.

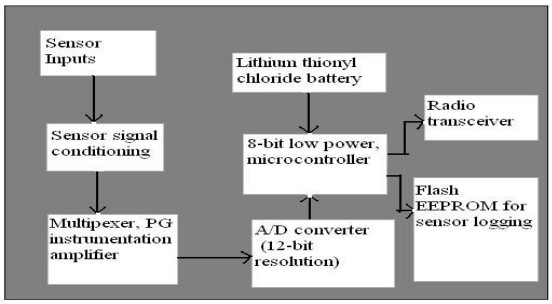


Fig 2.1 Wireless sensor network architecture

Further developments in this technology have led to integration of sensors, digital electronics and radio communications into a single integrated circuit(IC)package .Generally wireless sensor network have a base station that communicates through radio connection together sensor nodes. The required data collected at sensor node is processed, compressed and sent to gateway directly or through other sensor nodes.

B. Sensor node architecture:

A wireless sensor node is capable of gathering information from surroundings, processing and transmitting required data to other nodes in network. The sensed signal from the environment is analog which is then digitized by analog-to-digital converter which is then sent to microcontroller for further processing. The block diagram of a sensing node is shown in figure. While designing the hardware of any sensor node the main feature in consideration is the reduction of power consumption by the node. Most of the power consumption is by the radio subsystem of the sensing node. So the sending of required data over radio network is advantageous[7]. An algorithm is required to program a sensing node so that it knows when to send data after event sensing in event driven based sensor model. Another important factor is the reduction of power consumption by the sensor which should be in consideration as well. During the designing of hardware of sensing node microprocessor should be allowed to Control the power to different parts such as sensor, sensor signal conditioner and radio[13]. The main functions of microprocessor among various functions are as follows :Data collection management from other sensors. Power management functions are performed. Sensor data on physical radio layer interfacing. Radio network protocol management. Depending on the needs of the applications and on sensors to be deployed, the block of signal conditioning can be replaced or re-programmed. Due to this fact a variety of different sensors with wireless sensing node are allowed for use. To acquire data from base station remote
Nodes uses flash memory.

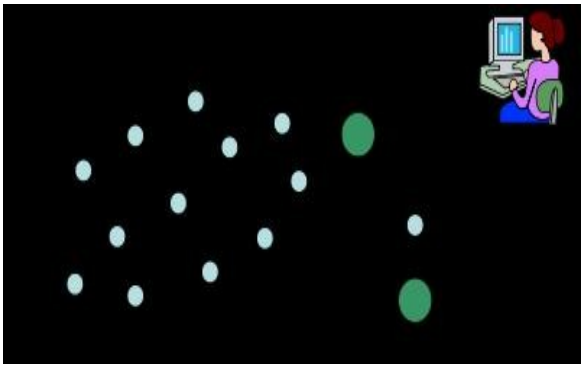


Fig 2.2 Block Diagram of functional Wireless Sensing Node

ISSN: 2278 – 909X All Rights Reserved © 2014 IJARECE

C. Sensor node components:

There are various sensor nodes having capabilities regarding power of microcontroller, radio and capacity of memory. Despite of the variances it can be said that there are four basic subs-Systems of sensor nodes; computing subsystem, sensing subsystem, power subsystem and communication subsystem[14].

D. WSN applications:

WSNs have a wide variety of applications such as environmental monitoring and tracking. The particular applications are tracking of object, monitoring of health, fire detection and Control of nuclear reactor. Deployment of sensor nodes in an area for collection of data is a typical application of WSN.

E. Monitoring of Area:

The common application of WSNs is monitoring of area. The events occurring in the Environment is monitored by the sensor nodes deployed in the region. Monitoring of area Involves detecting enemy intrusion by a large number of sensor nodes deployed over a Battlefield. The detected events are then reported to base station for some action[17].

F. Monitoring of Environment:

A large scale wireless sensor networks are deployed for environmental monitoring including forest fire/flood detection, monitoring of the condition of soil and space exploration.

G. Applications in Commercial Area:

Wireless Sensor Networks have a lot of applications concerning commercial are such as Office/home smart environments, health applications, controlling of environment in buildings, monitoring of industrial plants[36].

H. Tracking Applications:

In tracking area, WSN applications include targeting in intelligent ammunition and tracing of doctors and patients inside a hospital. A search and rescue system is designed using connectionless sensor based tracking system using witness (CanWest).Sensors with different radio frequencies and processing. Devices are used. This rescue system consists of mobile sensors, access points and GPS receivers. The Search and rescue efforts are concentrated on an approximate small area with the help of CanWest.

III.ROUTING PROTOCOLS IN WSN

A. Introduction:

Due to the difference of wireless sensor networks from other contemporary communication and wireless ad hoc networks routing is a very challenging task in WSNs. For the deployed Sheer number of sensor nodes it is impractical to build a global scheme for them. IP-based Protocols cannot be applied to these networks. All applications of sensor networks have the Requirement of sending the sensed data from multiple points to a common destination called sink. Resource management is required in sensor nodes regarding transmission power, storage, on-board energy and processing capacity[33].

There are various routing protocols that have been proposed for routing data in wireless sensor networks due to such problems. The proposed mechanisms of routing consider the architecture and application requirements along with the characteristics of sensor nodes. There are few Distinct routing protocols that are based on quality of service awareness or network flow whereas all other routing protocols can be classified as hierarchical or location based and data centric[35].

The routing protocols which are data centric are based on query and depend on naming of Desired data due to which many redundant transmissions are eliminated. The clustering of Nodes in hierarchical routing protocol aims to save the energy by cluster heads that can do some aggregation and reduction of data. The routing protocols that are location based relay data to the desired destination instead of the whole network by utilizing positioning information. In some applications there is requirement of Quos along with the routing functions that are based on network flow modeling are included in the last category[37].

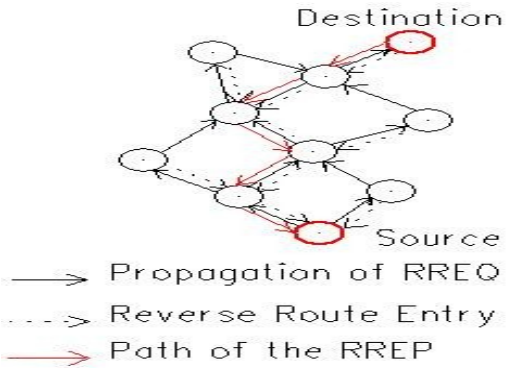
The other factors which effect routing design are the overhead and data latency. Data latency during network latency is caused by data aggregation and multi-hop relays due to which real-time data is infeasible in these protocols. while in some protocols there are excessive overheads created for the implementation of their algorithm which are not suitable for the networks that energy constrained. So data latency and overhead are the two important factors which affect the designing of routing protocols of WSN.

ISSN: 2278 – 909X All Rights Reserved © 2014 IJARECE

B. ROUTING PROTOCOL CLASSIFICATION IN WSN:

Data Centric Protocols:

The sink is used to send queries to certain regions and waits for data from sensors that are located in selected region in data centric routing protocols. As queries are used for the requested data, attribute-



based naming in order to specify the properties of data is necessary. The first data centric routing protocol between nodes that considers data negotiation is sensor protocol for information via negotiation (SPIN) for energy saving and elimination of Redundant data. A breakthrough in data centric routing is Directed Diffusion that has been developed[33].

Flooding and Gossiping:

In order to relay data in sensor networks without the need for any routing algorithms and Topology maintenance the two classical methods are flooding and gossiping[35]. A sensor node Broadcast a data packet to all its neighbors and this process continues until destination is Found and this technique is known as flooding where as in gossiping packet is not sent to all neighboring nodes but to selected random neighbors which selects another random neighbor and in this packet arrives at the destination.

Sensors Protocols for information via negotiation:

The key feature of SPIN is that meta-data before transmission are exchanged between sensors through data advertisement mechanism. The new data is advertised by each sensor node to its neighbors and the interested neighbors which do not have the data send a request message in order to retrieve data. The classic problems of flooding are solved by SPIN's meta-data negotiation.

Directed Diffusion:

In this protocol the idea is to diffuse data by using naming scheme for the data through sensor nodes. To get rid of unnecessary operations of network layer routing in order to save energy is the main idea behind using such a scheme[13].

Energy-Aware Routing:

To increase the lifetime of a network the authors Shah and Rabies proposed to use set of sub-Optimal paths occasionally. Depending on the energy consumption of the path, these paths are chosen by means of probability functions. The approach is concerned with the main metric of network survivability. This protocol has the following phases:

- Setup phase.
- Data communication and route maintenance phase.

Rumor Routing:

Another variation of Directed Diffusion is the rumor routing and is proposed for contexts in which geographic routing criteria are not applicable. The query is flooded in the entire network in Directed Diffusion when there is no geographic criterion to diffuse tasks. Thus the use of flooding is unnecessary in cases where a little amount of data is requested[17].

Gradient-based Routing:

Gradient based routing (GBR) proposed by Scourges is a slightly changed version of Directed Diffusion. In this routing scheme the idea is to maintain number of hops when the interest is Diffused through the network. So minimum numbers of hops are discovered by each hop to since That are called node's height. The gradient is the difference between node's height and that of its neighbor on that link. With the largest gradient a packet is forwarded on the link[18].

Card:

In order to maximize the energy gain and minimizing the bandwidth and latency, the idea is to query sensors and route data in network. Information-driven sensor querying (IDQS) and constrained anisotropic diffusion routing are the two proposed techniques. The information/cost objective is

ISSN: 2278 – 909X All Rights Reserved © 2014 IJARECE

evaluated by each node in CADR and data based on local information/cost gradient is routed[22].

Hierarchical Protocols:

The nodes in hierarchical routing are involved in multi-hop communication within a particular cluster in order to efficiently maintain the energy consumption and the transmitted messages to the sink are decreased by performing data aggregation and fusion. The formation of cluster is typically based on sensor's proximity to cluster and energy reserve of sensors. Networking clustering has been pursued in some routing approaches in order to allow the system to cope with additional load and enable to cover large area of interest without degrading the service[33].

Location-based Protocols:

Location information is required for nodes in sensor network in most of the routing protocols. Energy consumption is estimated by calculating the distance between two particular nodes for Which location information is required As there are no schemes like IP-addresses, data is Routed in an energy efficient way by utilizing location information[34]. By using the location of Sensors the query is diffused only in particular region which is known to be sensed, significant number of transmissions will be eliminated. The protocols are designed primarily for MANETs considering the mobility of nodes whereas they are also applicable to sensor Networks in which nodes are fixed or mobility is less. Location–based protocols are as follows:

Minimum energy communication network (MECN) and small minimum communication energy network (SMECN). Geographic Adaptive Fidelity (GAF),Geographic and Energy aware routing (GEAR).

Network flow and Quos-aware Protocols:

Among the various routing protocols proposed for sensor networks most of them fit in the classification however some pursue somewhat different approach such as Quos and network Flow. While setting up the paths in sensor network end-to-end delay requirements are considered in Quos-aware protocols. These protocols are: Maximum lifetime energy routing. Maximum lifetime data gathering. Minimum cost forwarding. Sequential assignment routing (SAR).Energy-aware Quos routing protocol.

AODV routing protocol:

Introduction:

There are two types of routing protocols which are reactive and proactive. In reactive routing Protocols the routes are created only when source wants to send data to destination whereas Proactive routing protocols are table driven[37]. Being a reactive routing protocol AODV uses Traditional routing tables, one entry per destination and sequence numbers are used to determine whether routing information is up-to-date and to prevent routing loops. The maintenance of time-based states is an important feature of AODV which means that a routing entry which is not recently used is expired. The neighbors are notified in case of route breakage[39]. The discovery of the route from source to destination is based on query and reply Cycles and intermediate nodes store the route information in the form of route table entries along the route. Control messages used for the discovery and breakage of route are as follows:

Route Request (RREQ):

A route request packet is flooded through the network when a route is not available for the destination from source. The parameters are contained in the route request packet are presented in the following table :

Source Address	Request ID	Source Sequence Number	Destination Address	Destination sequence number	Hop Count

Table 1 : Route Request Parameters

A RREQ is identified by the pair source address and request ID, each time when the source node sends a new RREQ and the request ID is incremented. After receiving of request message, each node checks the request ID and source address pair. The new RREQ is discarded if there is already RREQ packet with same pair of parameters. A node that has no route entry for the destination, it rebroadcasts the RREQ with incremented hop count parameter. A route reply (RREP) message is generated and sent back to source if a node has route With sequence number greater than or equal to that of RREQ.

ISSN: 2278 – 909X All Rights Reserved © 2014 IJARECE

Route Reply (RREP):

On having a valid route to the destination or if the node is destination, a RREP message is sent to the source by the node. The following parameters are contained in the route reply message.AODV routing protocol has three types of information: RREQs, RREPs, RRERs. When there is no route between source node and destination node, the source broadcast a RREQ to the ad-hoc network to establish routing discovery process. A route can be determined intermediate node with a 'fresh enough' route to the destination whose associated sequence number is at least as great as that contained in the RREQ[27]. The route is made available by unicasting a RREP back to the origination of the RREQ. If the flag 'G' in RREQ has been set and the corresponding intermediate node also send a RREP to the source node, it must unicast a RREP to the destination node freely too.

Source Address	Destination Address	Destination *Sequence Number*	Destination Address	Hop Count	Life Time

Table 2: Route Reply Parameters

3.3.1.3 Route Error Message (RERR):

The neighborhood nodes are monitored. When a route that is active is lost, the neighborhood nodes are notified by route error message (RERR) on both sides of link.

When source nod receives RREKP, it starts to send data to destination node. If intermediate node finds the next hop of a route which is transmitting data break, and there is no other effective routes to the destination, then the intermediate node will unicast or multicast RERR message to the destination. When originator receives RERR, it recreates the route according to the unreachable destination labeled in RERR. There is a list in RERR, it includes all the unreachable destination because of linkage break.

3.3.1.4 Hello Messages:

The HELLO messages are broadcasted in order to know neighborhood nodes. The Neighbor hood nodes are directly communicated. In AODV, HELLO messages are broadcasted in order to inform the neighbors about the activation of the link. These messages are not broadcasted because of short time to live (TTL) with a value equal to one[23].

Through local hello message, node can provide connection information for other nodes in the network, If a node belongs to a active route, it should use hello message. During each period of millisecond HELLO_INTERVAL intervening time, node will check whether it sends a broadcast message or not in the last interval of time. If it doesn't send, it can broadcast a HELLO message to maintain the route. Each node only maintain the route between itself and others by route table, and it needn't to maintain the whole route table[25].

3.3.2 Discovery of Route:

When a source node does not have routing information about destination, the process of the Discovery of the route starts for a node with which source wants to communicate. The process is initiated by broadcasting of RREQ as shown in figure 3. On receiving RREP message, the route is established. If multiple RREP messages with different routes are received then routing information is updated with RREP message of greater sequence number[27].

3.3.2.1 Setup of Reverse Path:

The reverse path to the node is noted by each node during the transmission of RREQ messages. The RREP message travels along this path after the destination node is found. The addresses of the neighbors from which the RREQ packets are received are recorded by each node[34].

3.3.2.2 Setup of Forward Path:

The reverse path is used to send RREP message back to the source but a forward path is setup during transmission of RREP message.This forward path can be called as reverse to the reverse path. The data transmission is started as soon as this forward path is setup. The locally buffered data packets waiting for transmission are transmitted in FIFO-queue[33].

ISSN: 2278 – 909X All Rights Reserved © 2014 IJARECE

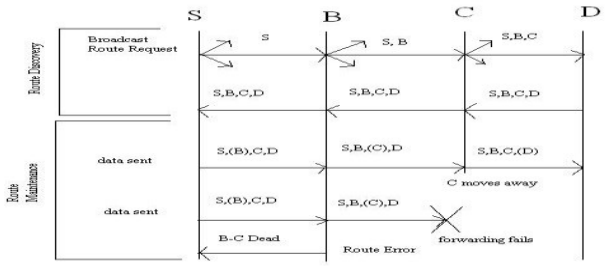


Fig 3.1 Discovery of route

3.4 DSP ROUTING PROTOCOL:

3.4.1 Introduction:

Dynamic Source Routing (DSR) protocol is specifically designed for multi-hop ad hoc networks. The difference in DSR and other routing protocols is that it uses source routing supplied by packet's originator to determine packet's path through the network instead of independent hop-by-hop routing decisions made by each node. The packet in source routing which is going to be routed through the network carries the complete ordered list of nodes in its header through which the packet will pass. Fresh routing information is not needed to be maintained in intermediate nodes in design of source routing, since all the routing decisions are contained in the packet by themselves[33].

3.4.2 DSR routing:

DSR protocol is divided into two mechanisms which show the basic operation of DSR. The two mechanisms are:

- Route Discovery.
- Route Maintenance.

When a node S wants to send a packet to destination D, the route to destination D is obtained by route discovery mechanism. In this mechanism the source node S broadcasts a ROUTE REQUEST packet which in a controlled manner is flooded through the network and answered in the form of ROUTE REPLY packet by the destination node or from the node which has the route to destination. The routes are kept in Route Cache, which to the same destination can store multiple routes. The nodes check their route cache for a route that could answer the request before repropagation of ROUTE REQUEST. The routes that are not currently used for communication the nodes do not expend effort on obtaining or maintaining them i.e. the route discovery is initiated only on-demand[36].

The other mechanism is the route maintenance by Which source node S detects if the topology of the network has changed so that it can no longer use its route to destination. If the two nodes that were listed as neighbors on the route moved out of the range of each other and the link becomes broken, the source node S is notified with a ROUTE ERROR packet. The source node S can use any other known routes to the destination D or the process of route discovery is invoked again to find a new route to the destination

IV.NETWORK SIMULATION

There are many simulation environments/network simulators available for simulation of a Network. There are some network simulators that require commands or scripts while other simulators are GUI driven. In network simulation the behavior of network models is extracted from information provided By network entities (packets, data links, and routers) by using some calculations. In order to assess the Behavior of a network under different conditions. Different parameters of the simulator (environment) are modified[38].

4.1 Network simulator:

4.1.1 OPNET tools:

The process of designing of different networks, applications, devices and protocols is accelerating by OPNET. The simulated networks can be analyzed for different technological impact designs on end-to-end behavior. OPNET enables designing of different networks and technologies in a development environment that includes TCP, MPLS, IPV6 and several others. The simulator has the key features involving discrete event simulation engine hierarchical modeling environment object-oriented modeling, integrated, GUI-based debugging and analysis and others[35].

Network Simulation tools can be divided into two types: code simulator and protocol simulator. The representative of code simulator is TOSSIM and the other is OPENET or NS2. However, no simulation tools can meet the requirement of WSN completely. So we use OPNET to do secondary development work for AODV routing protocol, and it is very important for improving the performance of WSN. OPNET was founded in 1986 by the information Decision Laboratory of MIT on the requirements of U.S. Department of Defense and issued its first business simulation software in 1987. OPNET adopts domain, node domain and process domain. And there are there editor corresponding to there domain described above. They are project editor, node editor and process editor.

ISSN: 2278 – 909X All Rights Reserved © 2014 IJARECE

4.1.2 Network Design:

To perform this simulation the network designed is wireless local area network (WLAN) Consisting of basic network entities as sensor nodes (mobile) and base station. To configure The application and for mobility of nodes profile configuration, application configuration, and Mobility configuration objects are included as shown in figure according to scenario. IN the First scenario there is then sensor nodes and the parameter end-to-end delay and throughput for both the routing protocols AODV and DSR are analyzed. In the second scenario the Number of nodes is increased to twenty and again the behavior of the protocols with the same performance metrics is analyzed. Finally there are thirty five sensor nodes and the two Protocols are evaluated in order to determine which one works the best under the required circumstances. All the networks are modeled on area of 500X500 under high network load. The simulation time is set for 1800secs.The entity base station in the network communicates with nodes in the network and the outer world. The nodes communicate with each other on demand basis relying on the type of application. The type of application that will run on base station and nodes is FTP.

The wireless local loop also called fixed wireless access, is a wireless technology for subscriber access. In WLL technology, different subscribers can access services of WLL with the help of a base station antenna. The possible subscribers are residential, office, government etc. The base station antenna is mounted on the top of a building or a pole. Every subscriber will be having their own antennas. The base station antenna provides support to these antennas through wireless communication links. The base station is in turn wired or wirelessly connected to a switching center. This center provides local and long distance telephone connections.

Fig 4.1 Wireless Sensor Network

4.2 Simulation parameters:

The network designed consists of basic network entities with the simulation parameters presented in table.

Examined Protocols	AODV
Simulation Time	900 seconds
Simulation Area (m x m)	500 x 500
Nodes in all scenarios	10, 20 and 35
Traffic Type	FTP
Performance Parameters	Throughput and Delay
Type of Nodes	Mobile
Mobility (m/s)	10 meter/second
Packet size	512 byte

Table 3: Simulation Parameters

V. ANALYSIS AND RESULTS

The results of our simulations are analyzed and discussed in this chapter. The results are analyzed and discussed in different scenarios having networks of ten, twenty and thirty five mobile nodes for Monitoring applications these different networks having mobile nodes represent monitoring applications in WSN. In the first scenario, a network with ten sensor nodes, the performance. Evaluation of the AODV and DSR routing protocols with the performance parameter of end-to-end delay is compared. After performing this simulation then the two protocols are analyzed in different scenarios by increasing the number of nodes from ten to twenty and then to thirty five making the network more complex and then comparison of the two protocols with the help of same performance parameter of end-to-end delay is analyzed. The same procedure is repeated for the other parameter throughput.

5.1 Ends-to-End Delay:

The term end-to-end delay refers to the time

ISSN: 2278 – 909X All Rights Reserved © 2014 IJARECE

taken by a packet to be transmitted across a network from source node to destination node that includes all possible delays caused during route discovery latency, retransmission delays at the MAC, propagation and transfer times. The protocol which shows higher end-to-end delay it means the performance of the protocol is not good due to network congestion.

5.2 Simulated results:

After simulation, we obtained results for AODV, DSR of their packet rate delivery ratio, Rate-drop, rate –delay and name outputs as shown in the following fig's1, fig2, fig3, we will compare the performance of results.

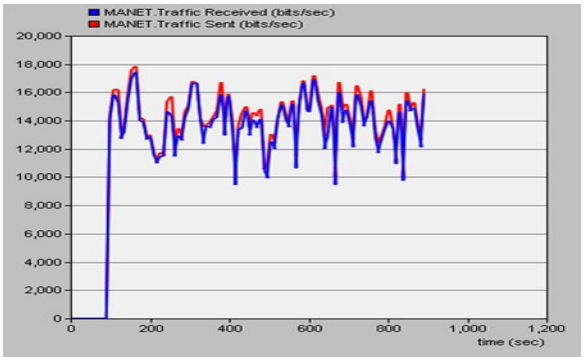


Fig 5.2.1: MANET Traffic Sent & Received

(bits/Sec)

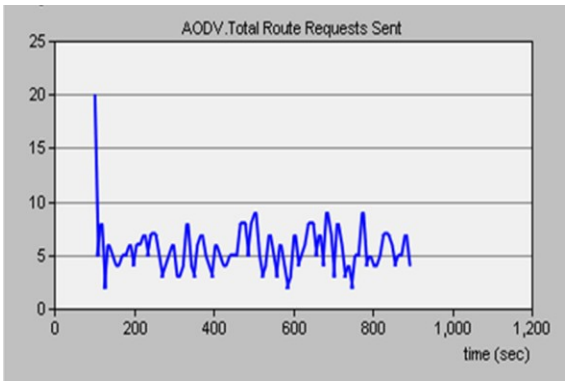


Fig5.2.2 : AODV. Total Route Request Sent

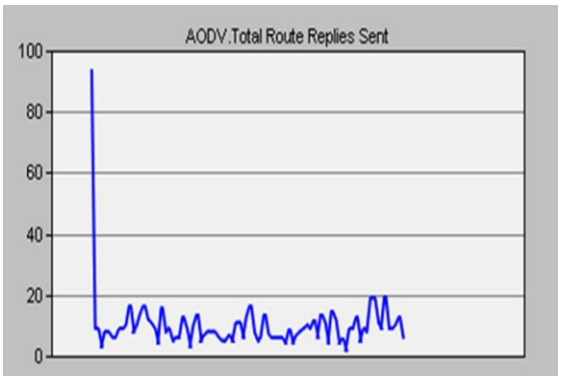


Fig:5.2.3 AODV. Total Route Replies Sent

VI.CONCLUSION&FUTURE SCOPE

In this paper is the evaluation of the two routing protocols for their responses to network scalability with respect to their packet end-to-end delay and throughput as their Performance metrics in cases of critical conditions monitoring applications such as military, Leakage of toxic gases and liquids in industrial plants etching terms of reliability and efficient use of network resources for mobile sensor nodes networks the selected performance metrics were subjected to identify protocols effectiveness and suitability. This is because in any network the demand in the demand for protocol reliability and effectiveness is vital. DSR and AODV implemented in three different scenarios having small, large and very large number of executing nodes in mobile nodes networks. In each scenario all the nodes were used as source nodes of sending data to a common base station. On the basis of results in this study analyzed and proved that AODV is more reliable protocol in terms of delay and throughput than DSR.AODV is more superior to DSR in terms of delay in all the three scenarios.Network size has no considerable effect on AODV performance with respect to delay but it does affect DSR.With respect to throughput AODV outperforms DSR in all the three scenarios of mobile nodes networks. The network size does not have a considerable effect on the throughput of DSR but in case of AODV it has considerable effect. In mobile nodes networks AODV is a good choice in all the three scenarios of small, large and very large network for minimal delay and higher throughput. On selected protocols, from the conducted study conclude that in overall performance one protocol is superior to other protocol. One protocol may be far better in performance than other protocol in terms of delay and throughput. The size of the networks also matters for the performance of the protocol.DSR has its own effectiveness in terms of consistency so selection of a particular routing protocol will depend on application type and intended use of network. The focus was on mobile

ISSN: 2278 – 909X All Rights Reserved © 2014 IJARECE

sensor nodes and the same protocols can be Analyzed in a fixed scenario especially in case if sensors are burnt due to fire and damaged due to climatic Changes then it will be interesting to observe the behavior of the routing protocols in case of some failure Of nodes and then checking the delay and throughput in both Routing protocols.

VII. References

[1.] S john, "Wireless Sensor Networks," Department Of Computer Science, University of Virginia, June 19, 2006.

[2.] T P Lambton and C G Pamayiotou, "Collaborative read Monitoring Using Wireless Sensor Networks with Stationary and Mobile Nodes," Department of Electrical and Computer Engineering, University of Cyprus, Cyprus, Vol. 2009, Mar. 2009.

[3.] I Kylie, S William, S Yogis and C Real, "Survey on Sensor Networks", Vole 40, Aug 2002, pp. 102-114.

[4.] B china, Vijay and P Say, "Sensor Networks Overview," Department of Computer Science, University of California.

[5.] V Remit, " Application of Wireless Sensor Networks for Environmental Monitoring & Development of an Energy Efficient Hierarchical Cluster based Routing," Department Of Electrical Engineering, National Institute of Technology, Rourkela, 2008-2009.

[6.] G. Barrenetxea, F. Interest, G. Schaefer and M Vetter, "Wireless Sensor Networks for Environmental Monitoring the Sensor Scope Experience", IEEE International Zurich Seminar on Communications (IZS), LCAV,I & C School, EPFL, Switzerland, Mar 2008,pp.98-101.

[7.] J. N. Al-Karaka and E Kamala, "ROUTING TECHNIQUES IN WIRELESS SENSOR NETWORKS SURVEY," IEEE Wireless Communication, Vole 11, Dec 2004, pp 6-28.

[8.] Y Kim, I Moon and S Cho, " COMPARISON OF IMPROVED AODV ROUTING PROTOCOL B SED ON IEEE 802 11 ND IEEE 802 15 4," Department Of Information Media Engineering School Of Engineering, Taylor's University College, Vole 4, No 2(2009) 132-141.

[9.] BOUKERCHE, "Performance Evaluation of Routing Protocols for Ad Hoc Wireless Networks," School Of Information Technology and Engineering (SITE), Ottawa, ONTKIN-6N5.Canada, 2004.

[10.] S Jalap, M belcher and L Wolf, "Evaluation of Routing Protocols for Vehicular d Hoc Networks in City Traffic Scenarios," Institute Of Operating Systems and Computer Network, Braunschwag, Germany.

[11.] S R das, R Castaneda, Y Jiangtao and R Sengupta, "Comparative Performance Evaluation of Routing Protocols for Mobile d hoc Networks," In proceeding of 7th International Conference on Computer Communications and Networks, Oct 1998, pp. 153-161.

[12.] R Castaneda, J yen and S R das, "Simulation based Performance Evaluation of Routing Protocols for Mobile d Hoc Networks," Department Of Compute Science, University Of Taxes, San Antonia, U.S.A, 2003

[13.] D. Dharmaraju. M. Rassi-Dehkordi, J Jai/J Barras, "Comparative Performance Evaluation Of Routing Protocols for Mobile d Hoc Networks (M NETs)" University Of Mary land

[14.] Z. Chang, G. Gaydadjiev and S. Vassilliadis, "Routing Protocols for Mobile d-hoc Networks Current Development and Evaluation," Computer Engineering Laboratory, EEMCS, Delft University of Technology, Delft, Netherland.

[15.] Al-Magnum-Abdullah, M. M. Raman and Hewed-Pink Tan, "PERFORM NCE EVALUATION OF TCP OVER ROUTING PROTOCOLS FOR MOILE D HOC NETWORKDS," IEEE First International Conference on Communications and Networking in China, Oct 2006, pp. 1-3.

[16.] G Martin, "n Evaluation on d-hoc Routing Protocols for Wireless Sensor Networks," 6 May 2004.

[17.] Lllazzawi, an Eikateeb, "Performance Evaluation Of WSN Routing Protocols Scalability," Vole 2008, pp 9

[18.] K Grantable, "Routing Protocols in mobile d-hoc Networks," M Sc Thesis, Department Of Computer Science, Umea University, Umea, Sweden, June 15, 2006.

[19.] C Yu, B Lee and H Y Young, "Energy Efficient Routing Protocols for Mobile d Hoc Networks," School Of Information and Communication Engineering, Sungkyunkwan University, Suwon, Korea.

[20.] Hear and M Fatty, "Performance Evaluation of Routing Protocols for High Density D Hoc Networks based on Energy Consumption by Glomosim Simulator," World academy Of Science, Engineering and Tec []hnology, 2007.

ISSN: 2278 – 909X All Rights Reserved © 2014 IJARECE

[21.] M Ismail and M Y Sanavullah, "SECURITY TOPOLOGY IN WIRELESS SENSOR NETWORKS WITH ROUITNG OPTIMIS TION," In proceeding in International Conference on Wireless Communication and Sensor Networks, Dec 2008, pp. 7-15.

[22.] J L Hill, "System architecture for Wireless Sensor Networks," University of California, Berkeley, U.S.A, 2003.

[23.] J Portlander Castro, E de la Torre and T Rison, "Modular Architecture for Wireless Sensor Network Nodes," Universidad Polytechnics de Madrid, E T S I Industrials' Division de Ingenieria Electronic.

[24.] M.Healy, T. News and E Lewis, "Wireless Sensor Node Hardware Review," In IEEE Sensors, Oct. 2008, pp. 621-624.

[25.] G Sklyarenko, "ODV Routing Protocol," Institute fur Informatics, Frey Universidad Berlin, Berlin, Germany.

[26.] K kayak and M Youngish, "survey on routing protocols for wireless sensor networks," Department of Computer Science and Electrical Engineering, University of Maryland, Baltimore, Baltimore, U.S.A, 2003.

[27.] Y Li, T Newer, "Wireless Sensor Networks-Selection Of Routing Protocol For Applications," Department of Electric and Computer Engineering, University of Limmerick, Ireland.

[28.] Zurkinden, "Performance Evaluation of Routing Protocol Real-Life Measurements," June, 2003.

[29.] V Kunchakarra, "SIMUL TION STUDY OF ROUTING PROTOCOLS IN WIRELESS SENSOR NETWORKS," Department of Computer Science, Somalia University, Dec 2005

[30.] X Cao, H Zhang, J Shi and G Cui, "Cluster Heads Election analysis for Multi-hop Wireless Sensor Networks Based on Weighted Graph and Practical Swarm Optimization," In the Proceedings of the 4^{the} IEEE International Conference on Natural Computational, Vol. 7, Oct. 2008, pp. 599-603.

[31] C Hainaut, W Huffing, H Jinzhou and G Chuanshan, "Event-based Trust Framework Model in Wireless Sensor Networks," In the proceedings of the IEEE International Conference on Networking, Architecture and storage, June. 2008, pp. 359-364.

[32.] J Yuck, B Mukherjee and D Ghostly, "Wireless sensor network survey," Department of Computer Science, University of California, Davis, U.S.A, April, 2008.

[33.] Wireless Sensor Networks: Principles and Applications, Available: http://microstrain.com/white/wilson-chapter-22.pdf.

[34.] Introduction to Wireless Sensor Networks, Available: http://www.worldscibooks.com/etextbook/6288/6288_chap1.pdf.

[35.] OPNET Technologies, Inc., the OPNET Simulator, http://www.opnet.com/solutions/network_rd/modeler.html.

[36.]Wirelesssensornetwork, http://en.wikipedia.org/wiki/wireless_sensor_network, January, 2008.

[37] Sensor Node, http://en.wikipedia.org/wiki/sensor_node, Sep, 2009.

[38.] D Johnson, D Malts and J Brooch, "DSR the Dynamic Source Routing Protocol for Multi-Hop Wireless d Hoc Networks," Computer Science Department, Carnegie Mellon University, Pittsburgh. *39+ D Malta, "The Dynamic Source Routing Protocol for Multi-Hop d Hoc Networks," Nov 5, 1999.

[39] M Ulla and ahead, "Evaluation of Routing Protocols in Wireless Sensor Networks," Department of Interaction and System Design, School of Engineering, Belching Institute of Technology, Rooney, Sweden, May, 2009.

[40] G GELET, "Performance Evaluation of Wireless Sensor Network Routing Protocols for Critical Condition Monitoring applications," Department of Computer Engineering, Addis Ababa University, Oct, 2007.

ISSN: 2278 – 909X All Rights Reserved © 2014 IJARECE