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Performance Analysis of Energy Efficient AODV Routing Protocol Using NS 2.34

Namrata S. Shinde, DiptiD.Shingade, Pranali D. Sonawane

***Abstract* -Statistics show that wireless technology is gaining popularity day by day. Today, people sitting at either ends of the country can communicate with each other with help of wireless technology. In this paper we compare the performance of three protocols for wireless networks: Dynamic Source Routing (DSR),Ad-hoc On-demand Distance Vector Routing (AODV) and Destination Sequence Distance Vector (DSDV). The performance metrics used for evolution are average energy consumption, packet delivery ratio, throughput, jitter,Residual Energy,End-to-End Delay. Simulation result shows that, AODV have a considerable better performance over the others for any number of nodes. The simulation will be done using NS2.34 network simulator.**

Keywords: WSN, AODV,DSR,DSDV

II.INTRODUCTION

WSN

The concept of wireless sensor network is based on a simple equation: Sensing+CPU+Radio=Thousands of potential application.The mobile Ad-hoc networks are self-organizing and self-configuring multihop wireless networks where,the structure of network changes dynamically,this is mainly due to the mobility of the nodes[1].Nodes in these networks utilizes the same random access wireless channel coordinating in a friendly manner to engaging themselves in multihop forwarding.Wireless ad-hoc network have gained a lot of importance in wireless communication.Wireless communication is established by nodes acting as router and transferring packets from one to another in ad-hoc networks.Routing in these networks is highly complex due to moving nodes and hence many protocols have been developed.Routing protocols in ad-hoc networks are divided into two categories:proactive(Table driven) routing protocols and reactive(On Demand) routing protocols[2].

A.*Proactive Protocols*

In this type of routing protocols,each node in a network maintains one or more routing tables which are updated regularly.Each node send a broadcast message to the entire network[3].DSDV(Destination Sequenced Distance Vector) is example of such routing protocol.

B.Reactive protocols

In this type of protocol,each node in a network discovers a route based on-demand.Whenever a node receives packets from upper layer for transmission.It floods a control message for route discovery and after of this route AODV(Ad-ho On Demand routing),DSR(Dynamic Source Routing) and ABR(Associativity Based Routing).

C.Hybrid Routing

Hybrid protocols are the combination of reactive and proactive protocols.By using advantages of these two protocols routes are found very fast in the routing zone. ZPR is example of hybrid protocol.

Energy consumption is main issue in wireless sensor network.so in this paper we are dealing with this energy consumption.In this paper we are calculating the parameters like throughput,jitter, end-to-end delay,packet delivery ratio,average energy consumption.

III.OVERVIEW OF AODV,DSR AND DSDV

A)AODV

Ad-hoc on demand Distance Vector Routing is a reactive routing algorithm, improvement over DSDV routing algorithm. It minimizes the number of broadcasts by creating routes on-demand as opposed to all possible routes as in DSDV.AODV is a loop free,single path,distance vector protocol based on hop-by-hop routing approach.AODV is capable of both unicast and multicast routing.The operation of protocol is divided into two functions.

1. Route Discovery

2. Route Maintenance

Route Discovery: When a Node want to send a packet to some destination node and does not have valid a valid route in its routing table for tht destination, it initiates a route discovery process. Source node broadcasts a route request (RREQ) packet to its Neighbours, which then forwards the request to their neighbours and so on. Nodes generates a

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Route Request withdestination address, Sequence number and Broadcast ID and sent it to his neighbour nodes. Each node receiving the route request sends a route back to the node

Route Maintenance: A route established between source and destination pair is maintained as long as needed by the source. When a link is invalid and a RERR message is sent to other nodes. These nodes in turn to propagate the RERR to their precursor nodes, and so on until the source node is reached. The affected source node may then choose to either stop sending data or reinitiate route discovery for that destination by sending out a new RREQ message.

Whenroute is needed to some destination,the protocol start route discovery.Then source node send route request message to its neighbours.If those nodes do not have information about the destination node,they will send message to all its neighbours and so on.and if any neighbour node has the information about the destination node,the node sends route reply message to the route request message initiator.On the basis of this process a path is recorded.A unique id is assigned,When a route request message is created.When a node received,it will check this id and address of the initiator and discarded the message if it had already processed that request.The use of hop-by-hop routing,sequence numbers and periodic beacons are borrowed from DSDV,plus,the basis on-demand mechanism of Route Discovery and Route Maintenance from DSR.Every node maintains two separate counters: 1) A node sequence number and 2)A broadcast-id. The AODV routing protocol does not need any central administrative system to control the routing process. Reactive protocol like AODV tend to reduce the control traffic messages overhead at the cost of increased latency in finding new routes.

B)DSR

DSR is one of the purest example of an on-demand routing protocol that is based on the concept of source routing.It is designed especially for use in multi-hop networks of mobile nodes.DSR is a routing protocol for wireless mesh networks.It allows network to be completely self configuring and does not need any existing network infrastructure or administration.DSR has a unique advantage by virtue of source routing.The protocol is truly based on source routing whereby all the routing information is maintained(continually updated) at mobile nodes.It has only 2 major phases which are Route Discovery and Route Maintenance[4].Route generated Reply would only be generated if the messaged has reached the intended destination node(route record which is initially contained in Route Request would be inserted into the Route Reply).To return the Route Reply, the destination node must have a route to the source node.If the route is in the Destination Node's route cache,the route would be used.

C)DSDV

DSDV is a table-driven routing scheme for mobile ad hoc networks which maintains a table to store the routing information. Each node will maintain a routing table in which all of the possible destinations with the network and the number of hops to each destination are recorded. Each entry in the routing table is marked with a sequence number which will avoid the formation of loops. In a very large population of mobile nodes, adjustments will likely be needed for the time between broadcasts of the routing information packets. To reduce the amount of information carried in these packets, two types of route packets are used. The first is the full dump packet carries all available routing information and these packets are transmitted in frequently manner. The second packet is the incremental packets which are used to carry the information that has changed since the last full dump.

IV. SIMULATION TOOL

This section described comparison between the AODV, DSR and DSDV routing protocol using the average end to end delay,packet loss,packet delivery ratio, throughput, jitter.All simulation have been carried out using Network Simulator 2.34 under Linux platform. NS2 is an open source simulator software and used by a lot of institutes and researchers. The main goal of the NS2 simulator is to provide support to education and research in networking.It is one of the best programmed in terms of comparing different routing protocols and designing new ones. NS2 has been written in two languages: Object oriented variant of Tool Command Language(OTCL) and object oriented language C++.

V. SIMULATION ENVIRONMENT

We use following Quantitative metrics to compare the performance.

1.Packet Delivery Ratio

Packet delivery ratio is the ratio of number of packets received at the destination nodes to the number of packets sent from the source nodes. The performance is better when packet delivery ratio is high.

2.Jitter

Jitter is the variation in the time between packets arriving, caused by network congestion, timing drift or route changes.

3. End-To-end delay

End-to-end delay indicates how long it took for a packet to travel from the source to the application layer of

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destination.The performance is better when packet end-to-end delay is low.

4.Throughput

The throughput is defined as the total amount of data a receiver R receiver from the sender divided by the time it takes for R to get the last packet.

5.Residual Energy

Residual energy is the remaining energy of the network at the end of the simulation. For better performance remaining energy should be more.

6.Average Energy Consumption

From the energy saving point of view important parameter which tell you about the average energy consumption of the overall network.It is calculated as ratio of total energy consumed to the number of nodes in the network.For better performance average energy consumption should be less.

VI.SCENARIO

As mentioned in proposed algorithm,for simulation of AODV some parameters we have to define.Following is the table of parameters:

Parameter Name	*Parameter Value*
Simulation area	*1000X1000 m2*
Number of nodes	*50,60,70,80,90,100*
Routing protocols	*AODV,DSR,DSDV*
Propagation model	*TwoRayGround*
MAC protocol	*802.11*
Initial energy	*10J*
Rx power	*0.3W*
Tx power	*0.4W*
Packet size	*1000 byte*
Simulation time	*120 sec*
Pause time	*25 sec,120 sec*
Speed of nodes	*4 m/s*
Antenna type	*OmniDirectional*
Transmitter height	*1.5 m*
Receiver height	*1.5 m*

VII.RESULTS

The following graphs shows the result :

1)Packet Delivery Ratio:

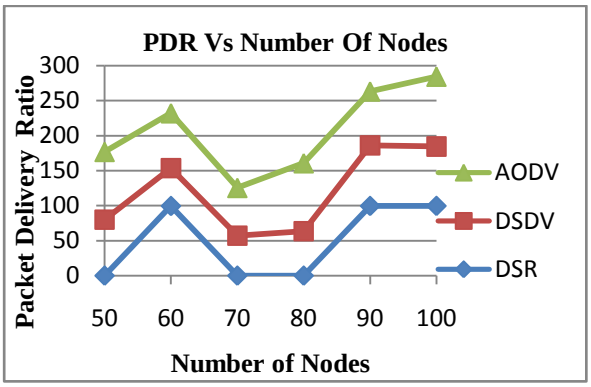

Fig.1 PDR Vs Number Of Nodes

2) Jitter:

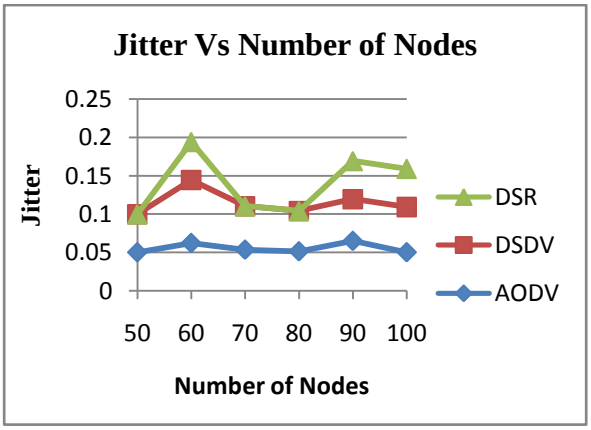

Fig.2 Jitter Vs Number of Nodes

3)End-To-end delay

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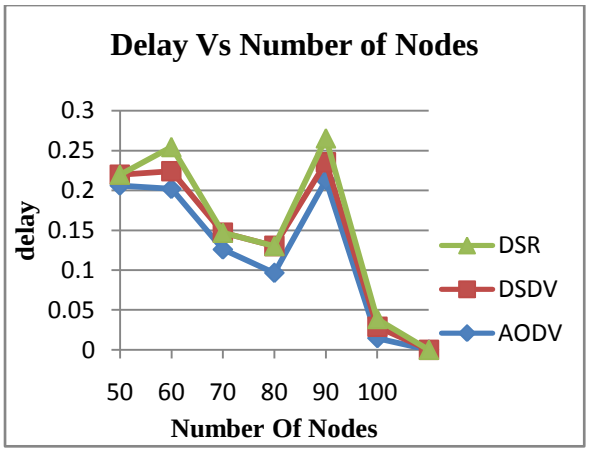

Fig.3 Delay Vs Number of Nodes

4) Throughput:

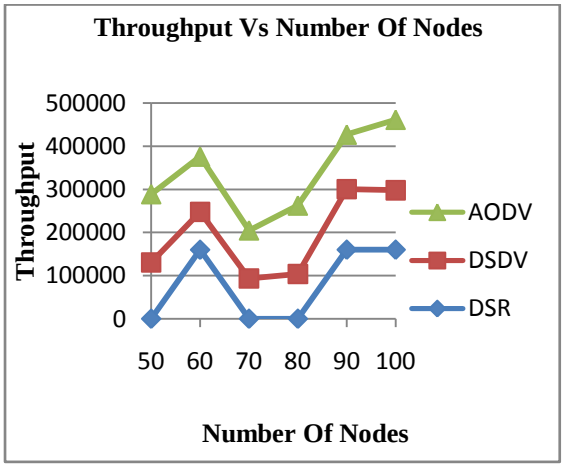

Fig.4 Throughput Vs Number Of Nodes

5)Residual Energy:

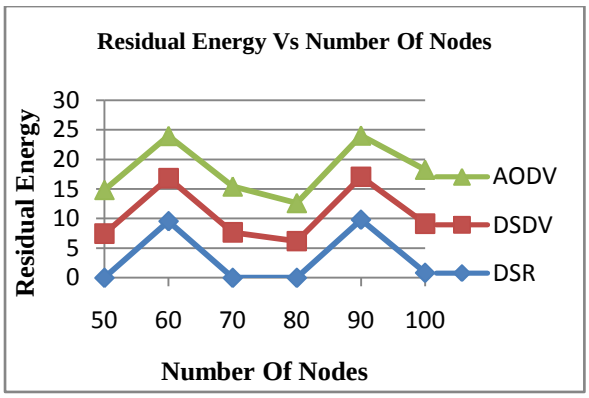

Fig.5 Residual Energy Vs Number Of Nodes

6)Average Energy Consumption:

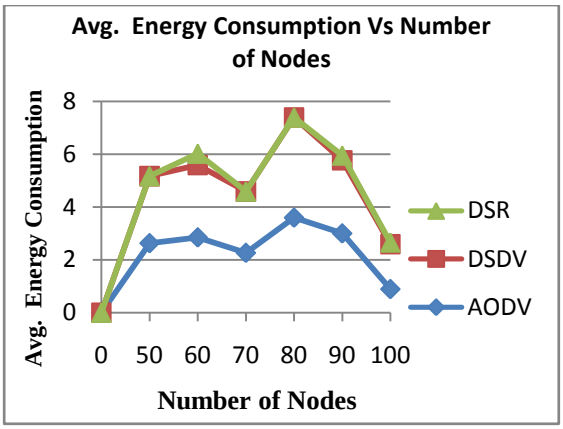

Fig.6 Avg. Energy Consumption Vs Number of Nodes

VIII.CONCLUSION

The work in this thesis is addressed with the problem of limitations of energy required for proper working of wireless sensor network. For the efficient use of available energy of sensor nodes different routing methods are used. Original Ad-hoc On Demand Routing algorithm in wireless sensor networks is a very hot research topic, because it has great research significance in better routing and prolonging network life cycle. In this thesis we have compared the three routing algorithm DSR, DSDV, AODV on the basis on calculated parameters likeAverage Energy Consumption,Residual Energy, Packet Delivery Ratio, End to End Delay, Throughput, Jitter.Amongst them AODV is combination of both the protocols, DSDV and DSR.So above results shows that AODV is better than the other Routing Protocols.

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