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Procreation of Hierarchical Routing Using AODV

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Abstract: **The Wireless Sensor Networks are used today to monitor hostile environments where the reach of human is not possible. For monitoring purposes in WSN, sensors are used that has capabilities of sensing, processing data and revelating the processed data to other sensors or surface station. To sense data in routing, data agglomeration and energy efficient protocols are designed for WSN as energy consumption is a serious issue in this network and thus after sensing data routing this data to destination is the main motive during the network. Hierarchical routing comes into existence that proves to be promising approach for point to point routing with a very small state of routing. Here in this paper, AODV routing is simulated for hierarchical routing in order to demonstrate its further use for realistic applications and WSN's setting. In this paper, the energy is very less consumed while having countable sets of sensors nearby for revelating data. At the end of the simulation, energy is saved and the connection with shortest distance comes out to be a lucrative result. In this paper, the state of art of AODV is presented by taking into deliberation of the topology changes during the energy depletion and node failure.**

Keywords— **AODV; hierarchical routing; simulation; WSN; routing; hoping; throughput**

I. INTRODUCTION

The WSN is comprised of individualistic sensor nodes that are deployed in area engaging conjointly for monitoring hostile environments and thus finding the conditions of these environments for the surrounding and experimenting on the data such collected. The WSN's advancement in research has proved beneficial for military applications and is extended to other areas like monitoring of industries, traffic controlling and health surveillance. The advancements in WSNs deployment at large scale is taken for revelation process because of easy deployment of sensor nodes [4]. However, the sensors have various constraints like power depletion, limited memory, low bandwidth and lack of processing power giving rise to decrease the network's lifetime. This is due to the reason that the networks once deployed is left unattended at remote places yet energy constraint routing should be formulated to increase the lifetime of network. Various researchers have tried to remove the energy constraint by proposing various routing protocols that can be taken as optimal solution for the network. Even the existing routing techniques were deployed for testing purposes and finding the gaps among the research. Thus, researchers modified the existing techniques in order to decrease or almost removing the constraints related to WSN. During the deployment of routing it has been assumed that routing, source and destination will be in stationary mode which is quite not possible in real environment. Thus, in order to increase the lifetime, hierarchical routing is considered in which the sensor will consume very less power at the time when not in process of revelation. In hierarchical routing various researchers have tried to send data to destination in an easy way but due to large number of sensors deployed, the energy is dissipated in sending data as sensors send the data in omnidirection and its sending is blocked due to the others sensors request of acknowledgements and traffic of signals within range [4][5][6][7][10]. Thus in order to remove this constraint, it is taken into consideration that few number of nodes will be added to the network as the distance among source and destination increases. This research proved better and provides a good routing technique for sending data to destination but is not taken at far level. The routing protocols such as AODV, DSDV, DSR came into existence for sending data [3][9]. Each of this protocol has their advantages and constraints if taken independently and is made for very small networks. AODV is used for routing on demand protocol. It helps in creating a route only if the connection by network is requested and at each level it stores the routing information at the source in finding the exact path of route by taking into consideration of routing tables. Thus, in the paper, the simulation is done on basis of AODV in hierarchical routing for providing the shortest path between source and destination nodes. The simulation results are evaluated at various performance metrics and the conducted evaluation brings out a better approach

and routing in hierarchical process with minimum energy dissipated. The remaining content is organised in next sections. Related work has been deliberated in section II. Simulation tool and performance metrics are presented in Section III. Section IV is comprised of Simulation Environment and Results drawn. At last, the primary conclusion is attracted Section V.

II. RELATED WORK

The modernistic interest of researchers for exploration of oceans had brought a revolution among the field of research in order to generate various revelation techniques for WSN. The researcher have proposed Dynamic Source based routing (DSR) which helped in getting information of routing from traffic due to the reason that DSR stores complete information of routing. Thus, DSR helped for generating and analyzing routing by sending multiple routing acknowledgements with route requests called as RREQs. It was also presented that DSR helped to sustain and overhead controlled packets during the routing for longer time [4][5]. Some worked on DSDV which is a protocol for finding shortest distance among various sensor nodes by using multi-hop revelation process. DSDV proves to be loop free routing as compared to traditional routing but is failed to update its routing information because of high overhead. AODV is introduced to combine the advantageous applications based on DSDV and DSR with keeping in view the information of sensor nodes and following single path to reach to destination. It helps in minimizing energy consumption by not broadcasting extra signals to the nodes which are actually not in range and also thus not storing those nodes' information in routing table. This helps in saving memory also. AODV has loop free routing and disseminates the information of breaking of links from nearby nodes. The intermediate nodes among source and destination gives reply only if they are in process of routing information related to RREQs. AODV proves to be better routing than existed protocols. Thus, it is extended further to AODV-I by storing information for processed congestion. This helps in reducing packet loss rate and end to end latency by enhancing the utilization rate of resources available. The authors have tried to minimize delay and improving ration of packet delivery by combining multi-hop accumulation with AODV routing [1]. It helps in reducing frequency of revelation. An improved protocol is introduced based on AODV for checking the nodes' capability of retaining information, battery status and its link state with different selection procedures [6][10]. This has proved to be a better approach for high delivery of packets and lowering node to node delay.

AODV-ES is an extension to AODV which uses third party model for replying to the acknowledgements sent through intermediate nodes by source to destination. The intermediate nodes which stores same routing information for destination need not to forward messages to destination. The authors even try to combine various modifications on AODV to improve the scalability of the networks [7]. It is done so in order to take the benefits of all the local nodes information and it seems to reduce overhead but the nodes are limited in this scenario. Thus, local ring based n-hop routing is done using AODV-ES in order to know that which nodes are near to the centred node [8]. The third party reply of AODV-ES proves to be good strategy for nhop count but the nodes here are limited and the concentration is filled on the centred node only. Some researchers try to combine various routing protocols with TTL-based recovery method for reducing the use of unnecessary bandwidth [3]. Here the author presented that if the link breakage is near to source or destination then tries for local repairing. The AODV's mobility is checked at different parameters such as PDR, delay and throughput in order to study its simulation scenario for random deployment of mobile nodes [9]. Some even try to design protocol similar to AODV to adhere the conditions of hostile environment in order to extend the sensors lifetime by introducing forwarder nodes [11]. As a whole the various parameters are proved to be working efficiently but not possible for larger environments where sensors are deployed enormously. At this point without hierarchical routing, the information cannot be send to longer distances taking in view various energy constraints of sensors network. Thus, in this paper, we attempted to restraint overhagging and end node stoppage by enhancing parcel conveyance proportion in various levelled directing utilizing AODV convention.

III. SIMULATION TOOL AND PERFORMANCE METRICS

The simulator tool used for the performance analysis of AODV protocol is NS-2. It is a tool that is object-oriented tool and it helps in encapsulating the independent items (sensor nodes) and is linked among each other to perform under the hierarchy of system [2]. The simulators based on network proves to be an efficient tool for analyzing various constraints like routing, protocols in network whether it is wired or wireless. Table 1 shows the simulation parameters

TABLE I. SIMULATION PARAMETERS

Attributes	Value
Simulator	NETWORK SIMULATOR
Simulation time	1 hour
No. of nodes	25
Environment size	???
Traffic type	Acknowledgements
Technology(model family)	Hierarchical

IV. SIMULATION ENVIRONMENT AND RESULTS DRAWN

In this simulation, 25 nodes are taken to configure hierarchical routing through AODV. There is node 1 i.e. source and it wants to send signals to node 25 i.e. destination. The process is simulated and run for 5 minutes. During this time, nodes send signals to pass on information to nearby nodes which is free and thus making a shortest distance between source to destination to send its data and getting acknowledgement for the same. The Figure 3 shows brown, blue, pink, green and orange nodes. The blue nodes are activating at first attempt of signals generated at source activating node 2. In second process, the pink nodes receive signals activating node 6. In next process, green nodes and thus orange nodes receive signals generating and activating node 14, 24 to come with shortest pat from node 1 to 25. The results drawn are shown in Figure 2.

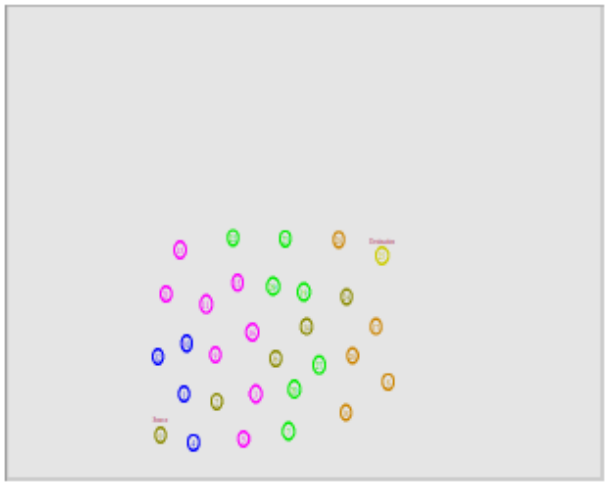
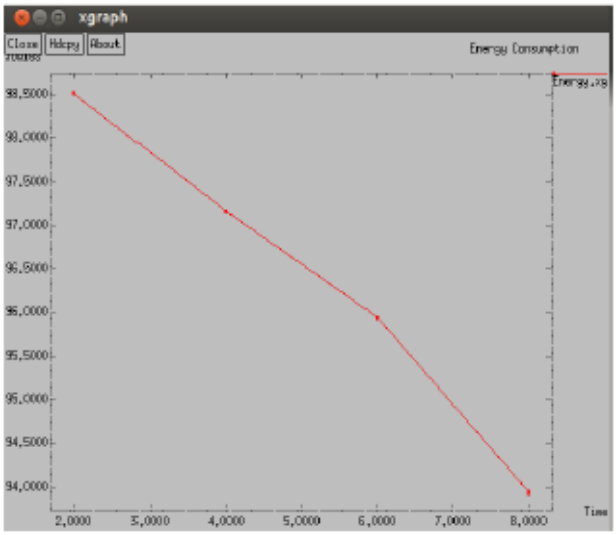


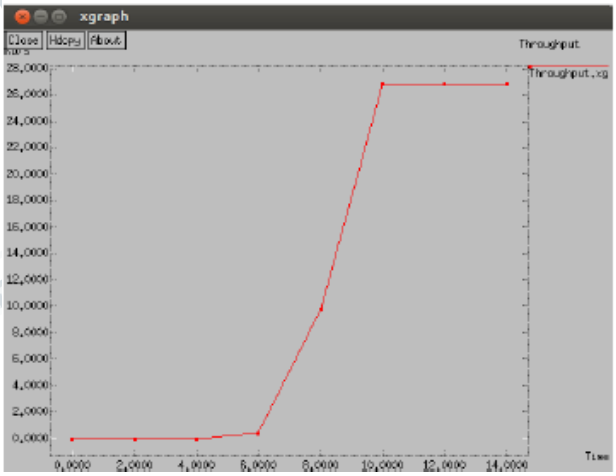
Figure 1. Simulation Environment

A. Energy Consumption

The Figure 2(a) shows the energy consumed by the nodes while sending and receiving signals. The energy of nodes are degraded by time. The process stops if any node which tries to make connection fails to send signal due to power loss.



(a)



(b)

Figure 2. Energy Consumption and Throughput

B. Throughput

The Figure 2(b) shows that with the involvement and adding up of nodes at each process try. The summation of nodes helped in developing a shortest distance among source and destination and thus with time the throughput of the connection and path thus made increases with time.

V. CONCLUSION

As the energy constraint and throughput of the network has an imperative role for conspiring any routing

protocol in WSN for application in hostile environment. Also, various QOS metrics like tolerance of delay, loss of data and lifetime of network are taken as crucial points for exposing reliability of network. Thus, taking into these metrics, the state of art of hierarchical routing using AODV is presented which appeals a node to node delivery of packets generating shortest path among source and destination. The results have shown better approach and maximum throughput with increase in number of sensor nodes at each step. The energy constraint is removed at some level as it decreases gradually with addition of other sensor nodes.

This constraint will be removed in future work by applying other routing protocols to ensure QOS as compared with latency in routing and thus providing the robust network for sending data/information to destination.

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