An Enhancement Approach for Reducing Energy Consumption In WSN: A Review

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ABSTRACT

Wireless Network consists of tiny nodes which are capable to communicate with each other. These sensor nodes are have limited power and major issue of WSN is energy consumption. In this paper we have proposed an enhancement approach to reduce the energy consumption and extend the life time of network. The improved method is based on the selection of proper cluster head and for collision avoidance the time lay technique of TDMA will be used. The AODV routing protocol is proposed to determine the proper path. By doing so, the energy consumption will reduce in term of various parameters like Packet Loss, Delay and energy consumed.

KEYWORDS: **Cluster Head, Time Lay, Sensor Node, Energy Efficiency**

Wireless sensor networks (WSNs) consist of large number of nodes which monitors the environmental conditions like temperature, humidity etc. These nodes are called senor nodes and they are small in size. The sensor nodes comprises of various components which are a sensing unit, processing unit, communication unit and power unit. The most important unit within sensor node is the processing unit

However, the main purpose of the nodes is to sense the environment for an event and communicate data to the Base Station. For the correct time event, these nodes must be synchronized among themselves and with global time. As the energy source is limited in WSN therefore to save energy is the major task.

II. COMPONENTS OF WIRELESS SENSOR NETWORKS AND CHALLENGES

WSN consist of thousands of tiny nodes having the capability of sensing, computation, and wireless communications. These nodes have to collaborate in order to fulfill their tasks as usually, a single node is incapable of doing so and they use wireless communication to enable this collaboration. The components consist in WSN are:

Sensor Field: A senor field can be considered as the area in which the nodes are placed.

Sensor Node: Sensor nodes are the heart of the network. They are in charge of collecting data and routing this information to sink.

Sink: A sink is a sensor node with the specific task of receiving, processing and storing data from the other nodes. They serve to reduce the total number of message that needs to be sent and reduced energy consumption.

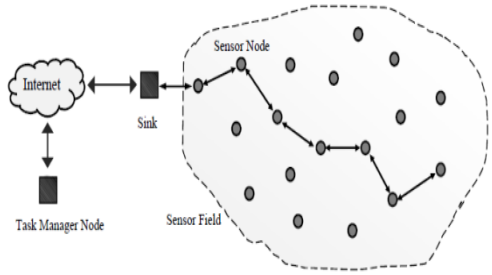

Fig 1. Components of wireless sensor networks

Task Manager: The task manager also knows as the base station is a centralized point of control within the network, which extracts information from network and disseminates control information back into the network. It also serves as a gateway to other networks. Base Station is either a laptop or a workstation.

In WSN there are numerous challenges and constraints present within these networks. The architecture and designing of WSN is affected a lot due to this. These challenges are:

- Energy
- Node Deployment
- Wireless Medium
- Hardware Constraints

- Security

III. ENERGY EFFICINET ROUTING PROTOCOL AODV:

The AODV is Ad-hoc on demand distance vector routing protocol. It is an energy efficient routing protocol and it is based upon the on demand ad-hoc routing protocol. This protocol determines a proper path with considering the node residual power. The proposed protocol aims to increase the overall sensor network life time by avoiding the traffic congestion which occurs on the specific node participating in data transfer. It is also capable of both unicast and multicast routing

Therefore, it is clear that AODV protocol is an on demand routing protocol which discover the route whenever a data transfer is requested between nodes The basic message set consist of in AODV is:

RREQ- Route Request
RREP- Route Reply
RERR- Route Error
HELLO- For link status monitoring

RREQ: This message is broadcast when mode needs to discover a route to a destination.

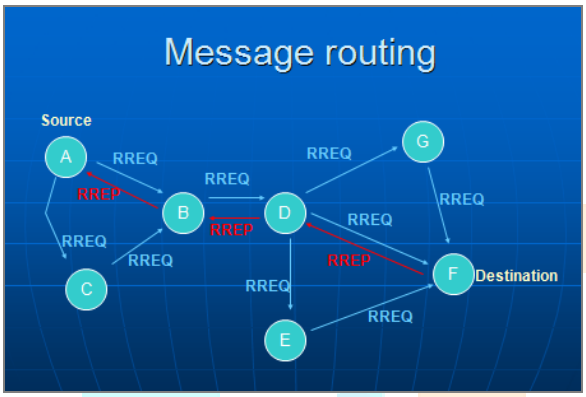

Fig 2. Message Routing of AODV Protocol

RREP: When RREQ reaches a destination node, the destination route is made available by unicast a RREP back to the route.

RERR: This message is broadcast for broken links.

HELLO: This message is used for broadcasting connectivity information a node should use Hello message only if it is part of an active route.

By comparing ADOV to LEACH, we see that ADOV results are better packet delivery rate throughput, listening and energy consumption than LEACH. The drawbacks of LEACH protocol are categories into three basic problems. The first issue is the inaccurate way to choice of cluster head. The second one is the inequitable sensor nodes distribution in cluster. In the smaller clusters the energy consumption is more as compare to the large clusters. The third problem is occurs in the steady phase. All sensor nodes within the cluster are continuously sending data even there is no updated data. Therefore, these reasons are for increase the energy consumption and reduce the network lifetime.

IV. CLUSTERING OF SENSOR NETWORK

Clustering plays an important role in WSN for reducing energy consumption. In a network the nodes are accommodated in small group and these groups are called Clusters. So divide the nodes into group by using some mechanisms. In every cluster there is a Cluster Head (CH) which is responsible for processing, data aggregation and transmission of the data to the base station. The other nodes are sending the sensed data to the cluster head. These are called member nodes. The figure below shown the clustering in WSN.

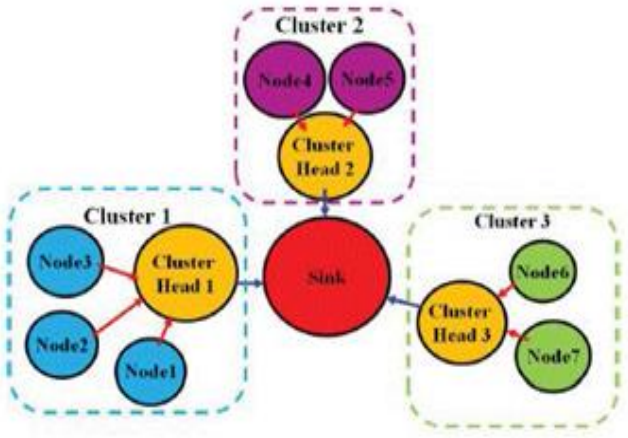

Figure 3: Clustering in WSN

There are two types of cluster routing:

1. Inter-cluster Routing
2. Intra-cluster Routing

Inter-Cluster Routing: CH communicates with BS directly. It can be two types' single hop and multi hop.

Intra-Cluster Routing: It explains the communication between member nodes and the Cluster Head. It is also of two types: Single hop and multi hop.

V. TDMA PROTOCOL FOR CHANNEL SENSING IN WSN

The medium access protocol is Time Division Multiplexing (TDMA). In TDMA the time id divide into time slots, the nodes can use this to transfer data. As we know the surrounding of data is monitored by sensor nodes present in the network. The collected data is further passed to other nodes in order to transfer data to destination node. There is an increase load in the complete network which needs to handle. The TDMA protocol is designed to handle such situation to avoid collision and reduced energy consumption.

In the TDMA protocol we have proposed time lay technique which will used for collision free transmission. The wireless sensor networks are the decentralized networks due to which clock synchronization in the major issue in WSN. The Time lay technique is proposed for clock synchronization, in which cluster head send the ICMP message to all the nodes in their respective cluster. The nodes receive the message and send their clock to the cluster head. The cluster head receive the time and calculate the average time. The cluster head send the message to each node to adjust the time according to the average time.

VI. TDMA CHARACTERSTICS

- A single carrier frequency is shared across numerous users within this protocol.
- Handoff is made easier with the help of non-continuous transmission.
- As per the demand the slots are assigned dynamic TDMA.
- Higher synchronization overhead.
- Power control is less due to minimization of Intersymbol interference.

VII. PROPOSED METHODOLOGY

Firstly, we will deploy the sensor network with infinite sensor nodes. All the nodes are grouped into clusters. Each cluster has a one cluster head. The cluster head is selected on the basis of energy resource and distance. A node which has higher energy and less distance to base station is selected as cluster head. After that cluster head send the ICMP message to each node and calculate the average clock time. Finally the nodes will set their clock time as per the average clock time. All the cluster heads set their clocks in a same manner. To avoid collision it is necessary to synchronize the network and all cluster head set their average time. The research methodology flow chart is shown below:

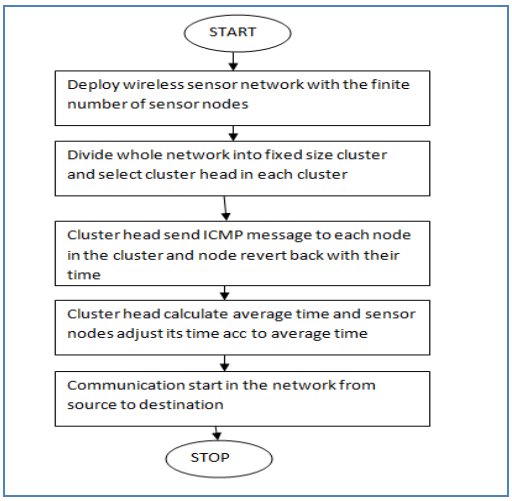

Figure 3: Flowchart of proposed modified TDMA technique

VIII. CONCLUSION

In this paper, an efficient approach to enhance the routing procedure using AODV protocol for WSN has proposed. All the senor nodes are deployed in the fixed area. Clustering is done and then the cluster head is selected as per the highest energy and the shortest path is selected by using AODV protocol. Here to avoid the collision time lay technique is used for clock synchronization. The proposed techniques are implemented in NS2 and it is been analyzed that the proposed techniques performs well in term of energy consumption, packet loss and network lifetime etc. This paper only focuses the energy consumption problem and how to minimize it.

REFERENCES

[1] I. F. Akyildiz, W. Su, Y. Sankarasubramaniam, and E. Cayirci, "A survey on sensor networks," *IEEE Commun. Mag.*, vol. 40, no. 8, pp. 102–114, 2002.

[2] Kurtis Kred, and Prasant Mohapatra, "Medium access control in wireless Sensor networks", 31July 2006, Conference on Computer Networks, vol. 51, pp. 961- 994.

[3] I. F. Akyildiz , W. Su , Y. Sankarasubramaniam , and E. Cayirci , " A survey on sensor networks " , IEEE Communications Magazine , vol. 40 , no. 8 , Aug. 2002 , pp. 102 – 114 .

[4] D. Estrin , D. Culler , K. Pister , and G. Sukhatme , " Connecting the physical world with pervasive networks " , IEEE Pervasive Computing , Jan. 2002 , pp. 59 – 69 .

[5] I. F. Akyildiz , W. Su , Y. Sankarasubramaniam , and E. Cayirci , " Wireless sensor networks: A survey ", Computer Networks , vol. 38 , no. 4 , Mar. 2002 , pp. 393 – 422 .

[6] F. Zhao and L. Guibas , Wireless Sensor Networks: An Information Processing Approach , Morgan Kaufmann Publishers , San Francisco, CA , 2004 .

[7] H. Lee, J. Yeo, S. Kim, and S. Lee: "Time slot assignment to minimize delay in ad-hoc networks," IST Mobile Communications Summit 2001 (Sept. 2001).

[8] Yang G. Kim and Myung J. Lee," Scheduling Multi-Channel and Multi-Timeslot in Time Constrained Wireless Sensor Networks via Simulated Annealing and Particle Swarm Optimization", IEEE AD HOC AND SENSOR NETWORKS, vol.13, pp.122- 129, 2014

[9] R. Rathna and A. Sivasubramanian, "Improving Energy Efficiency In Wireless Sensor Networks Through Scheduling And Routing", International Journal Of Advanced Smart Sensor Network Systems (IJASSN), vol. 2, pp.21-27, 2012

[10] Charanpreet Kaur and Amit Chhabra, "An Energy Efficient Multihop Routing Protocol for Wireless Sensor Networks", International Journal of Computer Sciences and Engineering, Volume-03, Issue-07, Page No (86-91), Jul -2015

[11] Subir Kumar Sarkar,T.G. Basavaraju. Ad-Hoc Mobile wireless network principles, protocols and applications. TK5103.2.S27 2007 Charles E. Perkins and Elizabeth M. Royer, " Ad-hoc on demand distance vector Routing ," in Proceedings of the Second IEEE.