Energy Aware Anycast Technique to Maximize the Life Time of WSN

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Abstract— Wireless sensor network is collection of sensor nodes and one sink node. Sensor nodes sense the signals and forward to the sink node. In event driven wireless sensor network where some event is happened that event is sense by one of the sensor node and forward to sink node. Sensor nodes are small in size so the energy capacity of sensor node is very less. In the event driven wireless sensor network energy is consumed when radios are on waiting for packet to arrive. In most of the Event-Driven wireless sensor network Sleep Wake-Up scheduling is used where most of the time sensor node is in sleep mode so that the energy is saved but one drawback of this sleep wake up scheduling is that it introduces delay in the network. So it is very important that to save the energy so that life time of sensor node is maximize for this "Anycat Packet " Forwarding scheme is used where each node forwards the packet to the first neighboring node that wake up among multiple nodes. In sleep wake-up scheduling energy consumed by sensor nodes are depends on the wake up rate of the node. If the wake –up rate of node having less energy is more then that node not alive more time.This paper gives the details of how anycast forwarding scheme is used along with Sleep Wake up scheduling to balance the wake up rates of all sensor nodes so that the lifetime of WSN is increase.

Index Terms— WSN, Anycast technique, Sleep –Wake up scheduling, Sensor node, Asynchronous.

I. INTRODUCTION

As a new technology in wireless sensor network is evolved so that the capability of remotely sense the environment is Increase. Such a system are placed in the area where there is hard to reach.So these system should work for long duration This work is concentrate on event driven asynchronous sensor networks where event occure rarely. This type of network is used in the environmental monitoring , intrusion detection etc. In such a event driven asynchronous sensor network there are four source of energy consumption.

1. To keep the radios on
2 To Transmission and Reception of control packets.
3 . To keep sensor on.
4. To data transmission and Reception.

This work is concentrate on asynchronous sleep wake-up scheduling protocols where each node wakes up independently of neighboring node in order to save the energy also concentrate on the balancing of the energy of each sensor nodes in the network so that the life time of the system will maximize.

The energy balancing is done with the help of asynchronous sleep wake up scheduling and anycast forwarding schemes. In this we change the wake up rate of sensor nodes with the parameter as the remaining energy of that particular sensor node.

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As we modify the wake –up rate of sensor nodes the life of that sensor node is maximize so the life of netwok is also maximize.

The rest of the paper is organized as follows. In section II mention the details of Anycast protocol. Section III mention the detail System Model which is used to Maximize the life time of WSN and in section IV conclusion .

II. ANYCAST PROTOCOL

Anycast is use of routing and addressing policies to find the most efficient path between source and multiple destination receivers. Layer 3 of routing is used to find out the significant target so that the packet is transferred.

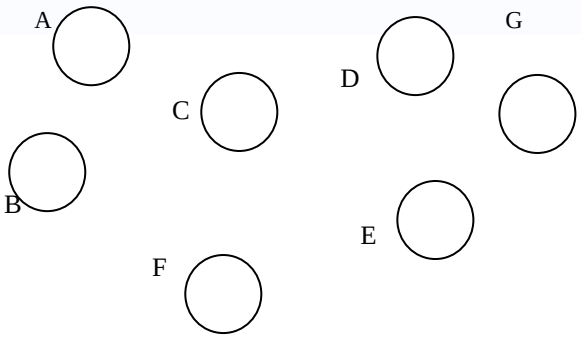

Fig. 2.1 WSN of N Nodes

Forwarding set of A is {B,C} means the node A can transmit the packet to either B or C depends on the wake-up position of B and C.

III. SYSTEM MODEL

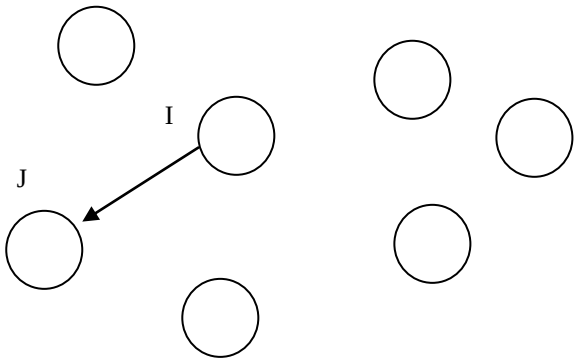

Fig. 3.1 WSN of N Nodes

In Anycast forwarding technique consists of forwarding set which is nothing but the set of nodes to which the packet will forward among all the neighbors.

In traditional packet forwarding scheme, every node has designed next hop to which packet should forward.

If that node is destroy then that packet is not forward to Destination. While in Anycast forwarding scheme that packet

is transferred to that node which is in Wake up state now.

Suppose From the figure 3.1 if the node **i** has packet to transmit with The help of Anycast forwarding scheme and asynchronous sleep wake up scheduling the packet is forward to node j.

Sleep wake up Scheduling policy:

Scheduling policy is used to find out how to forward the packet from source to destination. Sleep Wake up scheduling is used to find out when the nodes are wake-up. This sleep wake up scheduling is used to increase the lifetime of sensor nodes .Asynchronous sleep wake up each node wake up independently of neighboring nodes in order to save energy. Sleep wake –up scheduling is fully characterized by

- Wake-Up Rate:- Frequency the node wake up
- Wake-Up pattern:- The Sharing of wake up intervals.

Wake Up Rate:-

The wake up rate of node is the average of times that node wake up. Lower the Wake –Up rates result in less energy consumption.

$$\textbf{Wake –Up Rates} \quad \alpha \quad \frac{1}{\textbf{Life time of node}}$$

Energy balance using Asynchronous anycast protocol.

Configuration Phase:-

Configuration phase means initial phase where every node decides the wake up interval and pattern.

Operation Phase:-

1. When node sense the data and wants to send it, then it broadcast the ready to send signal along with update interval and remaining energy of self.
1. Anycast packet forwarding scheme is used for the communication.
2. Wake up rate of the receiving node which is intermediate node is changed according to the wake up rate of sender and remaining energy of sender and wake up rate of self and remaining energy of self.
3. If node j received RTS from node i with wake up interval Wi and remaining energy REi

Then the modified wake up rate for node j is calculated by following method.

$$\textbf{W jnew} = \textbf{WI} + \mu 1\, \Delta \textbf{Wi} \quad \text{----Eq. 1}$$

Where

μ1- Constant deciding smothers of change

ΔWi - Change in Wi

$$\frac{\text{New Wake up rate for J}}{\text{Wake Up rate of I}} = \frac{\text{REj}}{RE_j * W_i}$$

$$\Delta W_{J(\text{Change in wake up rate})} = \text{Wake up-old} – \text{Wake up-new}$$

$$\Delta W_{J(\text{Change in wake up rate})} = W_J - RE_j * W_i$$

$$\textbf{ΔWJ} = \textbf{Wake up J} - \frac{\textbf{REj} * \textbf{Wi}}{\textbf{REi}} \quad \textbf{-- Eq. 2}$$

From Equation 2 ... The new wake up rate for J node is determined which depends on the energy remaining of Node J

IV. SIMULATION RESULT

In this section I provide the simulation and results that provide the balancing of energies of nodes so that the life time of wireless sensor network increases. I simulate the proposed system using OMNET ++. To simulate in more realistic way 100 nodes over 1X 1 m. area. With the asynchronous sleep wake up scheduling and Anycast packet forwarding scheme I balance the energy of sensor nodes by updating the wake up interval of each sensor node.

Table 3.1 Simulation Result

Parameters	Values
Number of Nodes	**10**
Number of Sink	**1**
Placement of Source & Sink	**Static**
Initial Energy	**18720 J**
Receive Power	**62 mW**
Transmission Power	**62 mW**

With the help of energy balancing we can increase the life time of wireless sensor network. In the Fig. 5.1 shows the energy level of two sensor nodes by the values we see that the energy level of both nodes is nearly same. As shown in the Fig. 5.1 the energy level of nodes 1 and 2 are nearly same. If we plot the graph of different nodes in the network according to the energy vector of different nodes from that we observe that the energy level of different nodes are nearly same.

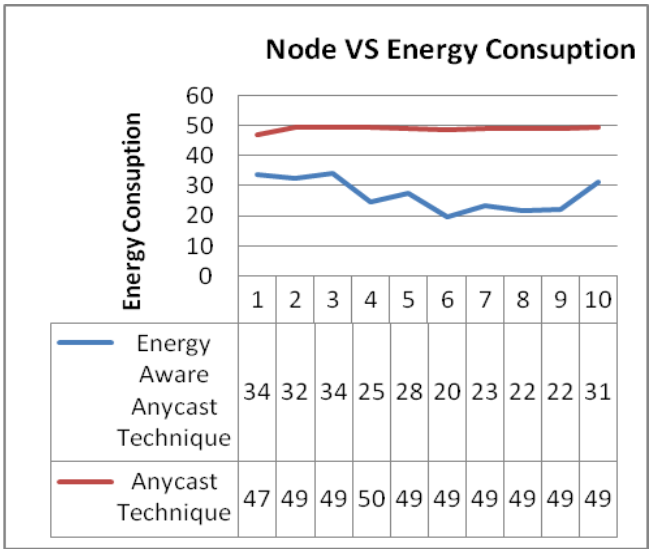

Fig. 5.1 Energy Consumed by Sensor Nodes

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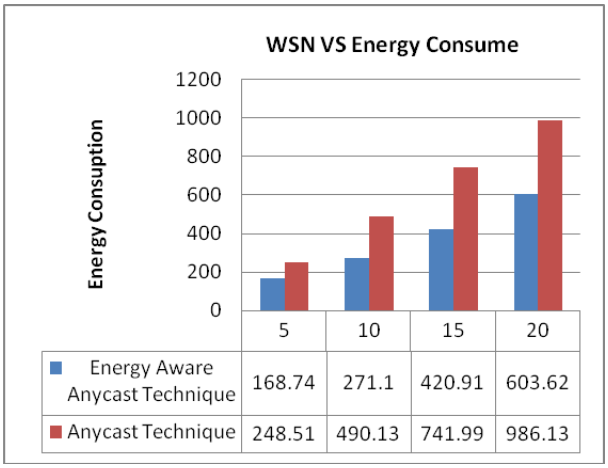

Fig.5.2 Size of WSN VS Energy Consumed

V. CONCLUSION

With the help of modification in the wake-up rates of sensor nodes i.e. minimize the wake up rates of nodes having less energy and increase the wake up rates of nodes having higher energy in the asynchronous event driven wireless sensor network we can increase the life time of wireless sensor network.

REFERENCES

1. Joohwan Kim,Student member ,IEEE,Xiaojun Lin,member,IEEE,and Ness B Shroff,Fellow,IEEE Optimmal Anycast technique for delay sensitive energy constrained asynchronous sensor networks. VOL 19,No 2 ,April 2011
2. Kim,X.Lin,N.B.Shroff, P.Sinha "Minimizing delay and maximizing lifetime for wireless sensor networks with anycast"VOL 18,No.2,PP 515-528 April 2010
3. J.Kim ,X.Lin,and N.B. Shroff "Optimal anycast technique for delay sensitive energy constrained asynchronous sensor networks"in Proc IEEE INFOCOM,Brazil,April 2009.
4. M.Rossi, M.Zorzi,and R.R.Rao " Statistically assisted routing algorithm for hop count based forwarding in wireless sensor networks "VOL 14,PP.55-70,Feb 2008.
5. W. Ye, H. Heidemann, and D. Estrin, "Medium access control with coordinated adaptive sleeping for wireless sensor networks," IEEE/ACM Trans. Netw., vol. 12, no. 3, pp. 493–506, Jun. 2009.
6. Y.-C. Tseng, C.-S. Hsu, and T.-Y. Hsieh, "Power-saving protocols for IEEE 802.11-based multi-hop ad hoc networks," Comput. Netw., vol. 43, pp. 317–337, Oct. 2008.
7. J. Kim, X. Lin, N. B. Shroff, and P. Sinha, "On maximizing the lifetime of delay-sensitive wireless sensor networks with anycast," in Proc.IEEE INFOCOM, Pheonix, AZ, Apr. 2008, pp. 807–815.