Scientific Journal Impact Factor (SJIF): 1.711
International Journal of Modern Trends in Engineering and Research
IJMTER
ISSN (ONLINE) : 2349 - 9745
ISSN (PRINT) : 2393 - 8161

An Improved EESW Energy Model for Wireless Sensor Network

Santosh patel [1], Umesh Lilhore [2]
[1] *M Tech Scholar CSE Dept, NIIST Bhopal (MP)*
[2] *A.P. in CSE Dept ,NIIST Bhopal (MP)*

Abstract - Energy conservation is one of the major important issues in wireless sensor networks. In WSN communication is based on battery operated computing and sensing devices. In WSN sensor networks energy to be deployed in an adhoc manner, with positive approach, individual nodes can be largely inactive at idle periods of time, but when something is detected then becoming suddenly active. In WSN the major challenges for research is conservation of energy. This research work reveals the correlations between node components and energy. Energy conservation and Life time issues in WSN can resolve by proposed Efficient Energy Awareness Scheme (EESW).EESW model is based on modified Network Energy Model, new event trigger method and Location aware variable. EESW also introduced energy consumption function and threshold function for WSN. Validating the result we have simulated our proposed algorithm in NS2 simulator and compare the EESW with Traditional Energy model based on different comparison parameters such as energy consumption, life time, end to end delay and packet delivery ratio. Simulation result clearly shows that the performance of EESW is much better than the traditional AODV protocol.

Keywords- Wireless Network, Wireless Sensor Network, AODV, EESW, Energy model and Energy consumption.

I. INTRODUCTION

A wireless sensor network (WSN) of spatially distributed autonomous sensors to monitor physical or environmental conditions, such as temperature, sound, pressure, etc. and to cooperatively pass their data through the network to a main location. The more modern networks are bi-directional, also enabling control of sensor activity. The development of wireless sensor networks was motivated by military applications such as battlefield surveillance; today such networks are used in many industrial and consumer applications, such as industrial process monitoring and control, machine health monitoring, and so on. Wireless Sensor Network usually contains thousands or millions of sensors, which are randomly and widely deployed [1]. The complexity of WSN designs has challenged researchers since the 70's.

1.1 Wireless Sensor Network– WSN is a wireless network consisting of small nodes with sensing, computation, and wireless communications capabilities. Each sensor collects data from the monitored area (such as temperature, sound, vibration, pressure, motion or pollutants). Then it routs data back to the base station[1,2]. WSN consist of hundreds or thousands of small, cheap, battery-driven, spread-out nodes bearing a wireless modem to accomplish a monitoring or control task jointly. An important concern is the network lifetime; decreases and the network can finally be partitioned and become dysfunctional [4].

1.2 The general wireless sensor network characteristics are –

a) Mobility- The fact that nodes can be rapidly repositioned and/or move is the raison feature of WSN [6].

b) Multi hopping- A multiple hop network is a network where the path from source to destination traverses several other nodes [8].

c) Self organization- The WSN network must autonomously determine its WSN configuration parameters including: addressing, routing, clustering, identification, power control, etc.

d) Scalability- In some applications the Wireless Sensor Networks can grow to several thousand nodes.

II. MAJOR CHALLENGES IN WIRELESS NETWORK

Wireless Sensor Networks have following issues-

a. Power Consumption – Power aware routing and Maintenance of power must be taken into consideration. For lean power consumption the communication related functions should be optimized for most of the light-weight mobile terminals [6].

b. Power Awareness-since the nodes in an ad hoc network typically run on batteries and are deployed in hostile terrains, they need rigorous power requirements. This means that the underlying protocols must be designed to conserve battery life.

c. Addressing scheme-The network topology keeps changing dynamically and hence the addressing scheme used is very important[11].

d. Network Size-The ability to enable commercial applications such as voice transmission in conference halls, meetings, etc., is an attractive feature of ad hoc networks (MANET). However, the delay involved in the underlying protocols places a strict upper bound on the size of the network[14,16]

e. Network Congestion -When the aggregate demand for resources (e.g., bandwidth) exceeds the capacity of the link, congestion results [1].

f. Packet delay and drop - A poor network performance can be offered due to congestion, e.g. high dropping and queuing delay for packets, low throughput and unmaintained average queue length which may not prevent the router buffers from building up, then dropping packets [2].

g. Degradation of the throughput-Degradation of throughput is an important issue in Wireless networks, due to congestion throughput degraded. It is the ratio between the numbers of sent packets vs. received packets [7].

h. Routing - The concern of routing packets between any pair of nodes becomes a challenging task since the topology of the network is frequently changing[12].

i. Internetworking - Harmonious mobility management is a challenge in mobile device due to coexistence of routing protocols [8].

j. Security and Reliability - A Wireless Sensor Networks has its particular security problems due to e.g. nasty neighbor relaying packets in spite of accumulation to the frequent vulnerabilities of wireless connection[13].

k. Quality of Service (QoS) - It will be a challenge on pro-viding various qualities of service levels in a persistently varying environment. It makes complicated to propose fixed guarantees on the services offered to a device due to intrinsic stochastic feature of communications quality in a MANET[7].

1. Proposed Energy Efficient Scheme

Energy is consumed in WSN during the transmission and receiving of data at router level. Save energy can be used for further communication. The energy computed is involved in the selection of optimal path, which requires minimum energy to route the data from source to destination. Energy Consumption Control model is based on-

I. **Processor Energy Model (PEM)-**Energy Consume by processor
II. **Transceiver Energy Model (TEM)-** Energy Consume by CPU and path
III. **Sensor Energy Model (SEM)-** Energy Consume by sensor

In this model, the relevant parameters are simplified to obtain the following formula:

$$P_{u,v}=Kd_{u,v}^{\alpha}$$

Where K is a Positive Number, α still takes 2 or 4
In [3] the directed graph Gs, Each edge (link) (vi, vi+1), set double weights as follows:

$$\theta(u) = \frac{P(u) - Kd_{u,v}^{\alpha}}{E(u)}$$

Energy Consumption Function For EESW

P(u) =denotes u in t period of residual energy , **$Kd_{u,v}^{\alpha}$** =Denotes energy lost in the communication
E(u)= Initial Energy given to the node. Where θ(u) is between 0 and 1 **or** $0 < \theta < 1$.

3.1 ALGORITHM FOR PROPOSED ENERGY EFFICIENT SCHEME FOR WSN

EESW Algorithm for Energy Efficient Routing in WSN

Input: *Initialize the nodes*
Output*: More life time and less energy consumption*
Step1: *Initialize the minimum Threshold value minth for the WS Network*
Es(P)=min i€p (Ei) //Now Calculate threshold vale Th by following formula
max-min=max (min)(Ei)
*minth=α * max-min // Calculate threshold value minth by below formula, where 0 < α < 1*
*maxth = minth * p , where p >1*
Calculate threhold maxth value
Step2: *select node for communication path*
-Firstly Broadcast a request by sender for selection of route in the network, PREQ
-By PREQ request message, only shortest path will selected from all the available routes.
-For communication between nodes, established a communication path
if ((Energy level for a node)> (available Threshold energy for the network))
Then only "Node is selected for communication"
Set Location Aware variable ,La=1 for active node and La=0 for inactive node
else "From the communication path ,reject all the node which are Unselected "
Step3 *– Calculate Energy consumption during communication, by EESW energy model function for processor ,transceiver and Sensor*
Step4*- Set Event trigger for processor, sensor and transceiver*
if (path is selected) { Activate Event trigger for communication node
Set S_E_trigger= 1, P_E_trigger=1,T_E_trigger=1 }
else Set Ictivate Event trigger for non communication node
Set S_E_trigger= 0, P_E_trigger=0 ,T_E_trigger=0 ,Where 1= Active and 0 = Inactive
Step5: *For all the remaining node, Form all the available path, recomputed route/path for communication For all the available nodes in the network*
do: (trigger not found)
if ((NODE Energy level) <= (Network Threshold energy or node is out of the network range))
-"low node energy warning is generated and forwarded it to the source and source will starts finding of new path/routes to the destination side.
if (Newly selected path contain minimum number of hops ,then only route is selected)
"When route selection done, energy consumption will at each node for sender and receiver"
else " For again selection of new communication path between communication node, either select previous path or go to step No 2 and perform all the steps continuously"
- In route recompilation Select only those route which is based on minimum no of
end

IV. SIMULATION AND RESULTS

The scenario was simulated by using network simulator2 (NS2) based on the network topology. Back End Program/Proposed Energy model was written in C++ and Front end inOTc1 programming language.

Following Input and Output Parameter were used.

1. Output parameters –following parameters were used

a) **Network energy** –energy can be defined ,energy = power * time

b) **Network life time-** life time = total energy/consume energy

c) **Packet delivery ratio**-The number of the data packets received by destinations to those generated by the traffic sources.

d) **Packet delivery ratio** = total data packet received / total routing packet.

e) **Throughput** = packet received / amount of forwarded packet (over certain time interval).

f) **Average end to end delay** - packet received time – packet send time/number of hop

2. Input Parameters- Transmission range-250 m, Wireless Bandwidth-2 Mb/sec, Simulation time-300s, Terrain-1000m x 1500m, Number of mobile nodes-50,Number of sources-3,Number of receivers-3,Number of connections-6,Traffic type -CBR,Packet rate-5, 10, 20 Packets/sec and Packet size-512 bytes, Pause time-10.0 sec,Minimum speed 1m/sec,Max speed-20m/sec,Routing protocol-AODV,ChannelType-Channel/Wireless-Channel, Initial energy-60,Network Interface -Phy/WirelessPhy/802.15.4,MACprotocol-Mac/802.15.4,InterfaceQueue-Queue/DropTail/PriQ ,Interface Queue length-100,Threshold value for energy-50,Mobility Mode-Random way point Model

4.1 COMPARISON PARAMETERS FOR (EXISTING) AND EESW (PROPOSED)-

For Comparison between Existing and proposed (EEWS), the following comparison parameters were used for calculating simulation results.

Parameters	No of Nodes	Mobility (mps)	Pause Time (Sec)	Terrain (m*m)
Simulation 1	Constant	Variable	Constant	Constant
Simulation 2	Variable	Constant	Constant	Constant
Simulation-3	Constant	Constant	Variable	Constant

Table4.1 -Comparison parameters for Simulation

Simulation 1 - In the simulation 1 parameter no. of nodes were Constant 50 used, and Mobility time is variable, It increases from 10 to 50. And rest of the parameters like as pause time, terrain was constant. The following Output Parameters were calculated –

1. Network Life Time- life time = total energy/consume energy

Packet Transmission Rate(Mbps)	Existing Model	Proposed (EESW)
5Mbps	**81.5**	**89.9**
10Mbps	**46.0**	**50.7**
15Mbps	**25.0**	**30.4**
20Mbps	**21.7**	**26.2**

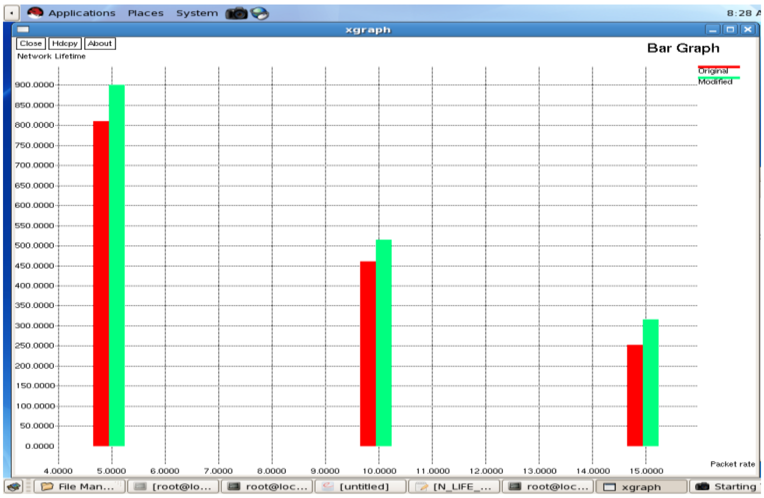


Fig4.1-Table and Graph for network Life time

Inference: - The above Figure shows the results of Energy consumption for Existing model and proposed model EESW.From the results, we can see that Proposed Model have better results than existing system.

2. **Avg End-to-end Delay-**

Mobility Mbps	Existing End to End delay	EESW End to End delay
10	510.64	477.59
20	625.45	586
30	856.54	573.02
40	904.31	649.93

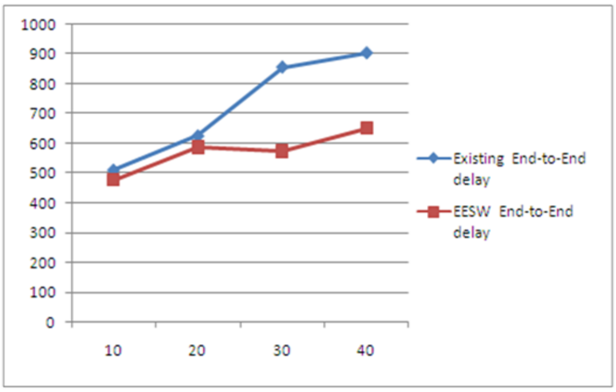


Fig-Table and Graph for Avg End to End Delay

Inference-The above Figure shows the results for Avg End to End delay(in Sec) for EESW and Existing Model. Graph clearly shows that EESW perform better than existing model.

Simulation 2 - In the simulation 2 parameter no. of nodes were variable vary 10 to 50 node. And rests of the parameters were constant.

1. Packet Delivery Ratio-

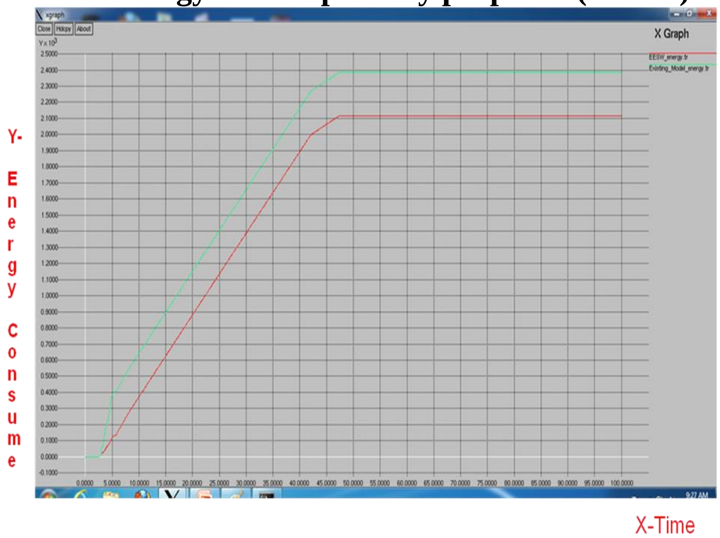
No of Nodes	Existing	Proposed
10	93.5	96.5
20	88.1	92.1
30	87.4	91.3
40	84.1	87.3
50	86.2	87.3

Fig- X Graph and table between PDR Vs No Nodes for EEWS and Existing Energy Model(in %)

Inference: - The above Figure shows the results of packet delivery ratio for varying the no of nodes from 10 to 50. Results clearly show that EESW perform better over existing model.

Simulation 3 - In the simulation 3 parameter no. of nodes were Constant 50 used, and time is variable, It increases from 10s to 50s. And rest of the parameters was constant.

1. Network energy consumption by proposed (EESW) & Existing Model -



Time Sec	Existing Model	Proposed (EESW)
	Energy Consumption	Energy Consumption
10	0.62	0.38
20	1.15	0.88
25	1.4	1.18
30	1.66	1.39
35	1.91	1.68
40	2.15	1.92

Fig-Table and Graph for network energy consumption by Proposed & Existing

Inference: The above Figure shows the results of Energy consumption for Existing model and proposed model EESW.From the results, we can see that Proposed Model have better results then existing system.

V. FUTURE EXPANSIONS

In most of the cases mechanism is not applied to real implementation. In future we will apply this mechanism in real implementation instead of just a Simulation In future also I would like to include the security mechanism in my method and make the tradeoff between security and energy. In future EEWS can also implemented with other protocols such as TORA,DSDV and other, instead of AODV.

VI. CONCLUSION

Proposed EESW scheme and Existing Scheme were simulate on NS2 simulator and compare with existing Energy Model. After the simulation results clearly shown that, proposed model EESW performs better than the Existing Energy Model. EESW are improving the following parameters for WSN, like Network life time, Packet Delivery and End to End Delay as Compared to Existing Energy Model. EEWS shows less energy consumption over existing model and can be applied to large network to increase the Stability.

REFERENCES-

[1]Bhabani sankarGounda1, Ashish kumar Dass2,K.Lakshmi Narayana3,"A Comprehensive Performance Analysis of Energy Efficient Routing Protocols in different traffic based Mobil Ad-hocNetworks",Published,byIEEE,978-1-4673-5090-7/13/$31.00©2013IEEE.
[2]Chun Jin1, Xing Liu2, Zi Ren3,"ENERGY-BASED WIRELESS SENSOR NETWORKS TO IMPROVE THE AODV PROTOCOL", Published by Proceedings of ICNIDC2009,978-,2009IEEE.
[3] Hai-Ying Zhou1,Dan-Yan Luo2,Yan Gao, DeCheng Zuo3," Modeling of Node Energy Consumption for Wireless Sensor Networks ", Published by Scientific Research,Wireless SensorNetwork,2011,3,18-23
[4]Zhimu Huang1,Ryo Yamamoto2,Yoshiaki3,"A Multipath Energy Efficient Probability Routing Protocol in Ad Hoc Networks", Published by ISBN 978-89-968650-3-2 ICACT2014 page,16-19.
[5]Stefanos A. Nikolidakis1, Dionisis Kandris2, Dimitrios D. Vergados3and Christos Douligeris4." Energy Efficient Routing in Wireless Sensor Networks Through Balanced Clustering",Published,by,Algorithms2013,6,pp29-42;doi:10.3390/a6010029
[6] Rajgopal Kanana1,Lydia Ray2,Ramaraju3 and S. Siharaman Iyengar4,"Threshol Energy Constrained Routing Protocol for Wireless Sensor Networks", Published by NSF DARPA,Sep-5- 2003.
[7]Mansoor-uz-Zafar Dawood1,Noor Zaman2,Abdul Raouf Khan3,Mohammad Salih4," Designing of energy efficient routing protocol for Wireless Sensor Network (WSN) Using Location Aware (LA) Algorithm",Published,by Journal of Information & Communication Technology,Vol.3,No.2pp56-70,
[8]Daquan Feng1, Chenzi Jiang2, Gubong Lim3, Leonard J4," A Survey of Energy Efficient Wireless Communications", Published by IEEE Communications surveys & tutorials, vol. 15, no.1,2013
[9]Chansu Yu1,Ben Lee2,Hee Yong Youn3," Energy Efficient Routing Protocols for Mobile AdHoc-Networks",Published.by-EFFRD,0210-0630-10.
[10] Nazif Cihan Tas1,Chellury (Ram) Sastry2,Zhen Song3," IEEE 802.15.4 Throughput Analysis under IEEE802.11Interference", Published by IEEE, 42(6):140– 146, June 2009
[11] Zhimu Huang1,Ryo Yamamoto2,Yoshiaki3,"A Multipath Energy Efficient Probability Routing Protocol in Ad Hoc Networks", Published by ISBN 978-89-968650-3-2 ICACT2014 page 16-19.
[12] Hung Le Xuan1, Sung young Lee2," Two Energy-Efficient Routing Algorithms for Wireless Sensor Networks",Published by Networking IEEE and ACMT Transaction son Volume:11,Issue:1,Feb.2003Page(s):2-16.
[13]UmeshKumar Lilhore,Praneet Saurabh,Bhupendra verma "A New Approach to Overcome Problem of Congestion in Wireless Networks", Published by Springer Berlin Heidelberg 2012,pp499-506.
[14] C. Yu, B. Lee and H. Y. Youn, Energy Efficient Routing Protocols for Mobile Ad Hoc Networks, Cleveland State University, EFFRD Grant No. 0210-0630-10.
[15] K.Gorantala," Routing Protocols in Mobile Ad Hoc Networks," Master Thesis, Department of,Computing,Science,Umeoa-University,Sweden,June2006.
[16] G. Girling, J. Li Kam Wa, P. Osborn, R. Stefanova, The Design and Implementation of a Low Power Ad Hoc Protocol Stack, IEEE Personal Communications, 2000.
[17] R.V.Biradar, V.C.Patil, Dr. S.Sawant, and Dr.R.R.Mudholkar," Classification and comparison of routing protocols in wireless sensor networks", UbiCC Journal, Vol.4.