International Journal of Advanced Information Science and Technology (IJAIST) ISSN: 2319:268
Vol.3, No.3, March 2014 DOI:10.15693/ijaist/2014.v3i3.97-103

Energy balancing and Analysis and Simulation Of the DMED Protocols for the Planetary Exploration in the Wireless Sensor Network

S.Saravana Kumar
Assistant Professor/Department of CSE
SVS College of Engineering, Coimbatore
Anna University, Chennai, India

NeethuPrabhakaran P
PG Student/Department of CSE
SVS College of Engineering, Coimbatore
Anna University, Chennai, India

***Abstract*—Simulation is the one of the most useful technique for evaluating the networking performance and making the model of the real world object. Wireless Sensor network is the one of the most suitable network for sensing the environmental conditions. There are several sensing nodes are equipped in the wireless sensor network for sensing the temperature, pressure, humidity etc. Planetary exploration is the process of collecting and discovering the information about the planetary system and to analyze its physical and chemical and environmental characteristics. Protocols are the set of rules or algorithms for the particular network operations. There are different types of protocols are to be used. Reactive protocol and proactive protocol are the main two important types of protocols. Proactive protocol is the static routing protocol, its routing path and routing method is already fixed. Reactive Protocol is the dynamic routing protocol, it routing its packet in an on demand basis. The dual mode energy driven routing protocol is an reactive protocol, it has a day mode and night mode. The day mode is the charging state of the solar battery which is embedded in the planetary surface sensor system. The night mode is the sleeping state of the solar battery. In the night the energy of the nodes is dropped sharply. Then there are several techniques is used to maintain the energy. Adhoc on demand distance vector routing protocol is the existing protocol but it has several disadvantages like unnecessary bandwidth consumption, packet delivery is difficult, energy losing problem. Researchers prove that the dual mode energy driven routing protocol is suitable to overcome the energy loss problem. The main objective of this paper is to analysis and simulation of the dual mode energy driven routing protocol and at the same time improving the energy efficiency and balance the energy.**

Index terms -WSN, DMED, AODV,Routing Protocol, Planetary Exploration, Day mode, Night mode , Energy Efficiency.

I. INTRODUCTION

A. DMED in Wireless Sensor Network.

Wireless sensor network is the sensing network which contains the different spatially distributed autonomous sensor nodes and each sensor node is sensing and detecting the environmental conditions such as pressure,sound,temperature etc .The dual mode energy driven routing protocol is mainly implemented for improving the energy efficiency with energy balancing considerations and avoiding the energy loss problem Ns2 simulation is used for implementing and analyzing the network performance of the DMED protocol.DMED protocol is specially developed for the special environmental and planetary conditions and the planetary surface sensor system is mainly contains the two modes, day mode and night mode.The day mode is the charging state of the solar battery in the DMED and the night mode is the sleeping state of the solar battery. Planetary condition is challenged by different environmental conditions such as energy density,pressure and special temperature.To detect the environmental conditions wireless sensor network is to be used.

DMED protocol uses the energy in the optimal and the efficient and useful way.There are different sources of renewable energy such as solar energy,wind energy.DMED mainly uses the solar energy which is the most important and most useful renewable energy resource in the world. Solar energy comes from the sun in its reaction of thermo nuclear fusion. Planetary surface sensor system is used in the DMED and it is embedded with the highly solar powered sensor node.DMED improves the network life time efficiently and effectively.In the case of DMED energy utilization and energy consumption is decreased effectively with the strategy of combining the circular path and the shortest path.The routing scheme balances the energy among multiple and different paths

B. Network Simulation in DMED

The motivation of the networking simulation is to learn the fundamentals of evaluating the network performance and to analyze the overall network performance.To implement the dual mode energy driven routing protocol Ns2 simulation is to be used and Ns2 simulation is the most fundamental type of discrete event simulation.Ns2 provides the substantial and essential support for the simulation of the TCP protocol and different routing process and at the same time the multicast routing protocol over wired networks and wireless networks.

Simulation helps to find the bugs in the design in advance and to evaluate the design alternatives in the networking research areas and to evaluate the complex functions. Space simulation and fight simulation are the examples of the networking

simulations. Analytical and numerical techniques are used in the simulation.

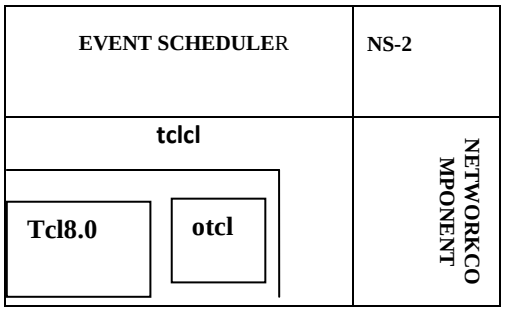

Figure 1:Network components used for simulation.

There different types of simulation tools are to be used.NS-2 and NS-3 simulation are most important simulation tools. Simulation is the process of simulating the real word process.NS2 provides the essential and substantial support to simulate a group of protocols like TCP, FTP, UDP,HTTP and DSR.Ns2 is primarily Unix based and it uses Tool Command Language TCL as a scripting language.ns2 is a standard experiments environment in the networking research areas.

II. ANALYSIS OF THE PROPOSED WORK

Simulation is the one of the most useful technique for the analysis and the evaluation of the networking performance and it is the model of the real world object or real time system.There are different types of simulators are to be used.Ns2 and Ns3 are the most important discrete event simulators targeted at the networking research areas.Routing protocols are used for finding the routes or optimal path between the different nodes.Planetary exploration is the process of searching the discovery of the planets in formations and to collect its biological and physical and chemical characteristicallyin formations.Adhoc on demand distance vector routing protocol is the commonly used protocol for planetary exploration but the energy efficiency is very less in this protocol.Dual mode energy driven routing protocol is the new routing protocol for improving the energy efficiency and avoiding the energy loss problem

A .Day Mode in DMED

The planetary surface sensor system is contained in the dual mode energy driven routing protocol .In the planetary surface sensor are the autonomous sensors and at the same time it is performed as efficient solar batteries and the day time solar batteries are to be charged. At this time find the optimal shortest path between the source node and sink node and this time route stable is the key design.

B . Night Mode in DMED

Energy as the key design point in the night mode. Energy of the node is dropped sharply in the case of night mode. Each node in the planetary surface sensor is energy challenged.DMED maintains the node energy with the help of energy balancing criteria.

C. WSN Modelof Planetary Exploration.

There are different types of systems are used for maintaining the model of the wireless sensor network. different sensor nodes are embedded in the planetary surface sensor system and each node is maintain its energy. The most important systems which is used in the WSN model of planetary exploration are described below.

1) Satellite sensor system
2) Planetary surface sensor system
3) Event Management system
4) Communication system
5) Internet

These systems are helps in the different parts of the communications.

III. ARCHITECTURE OFDMED

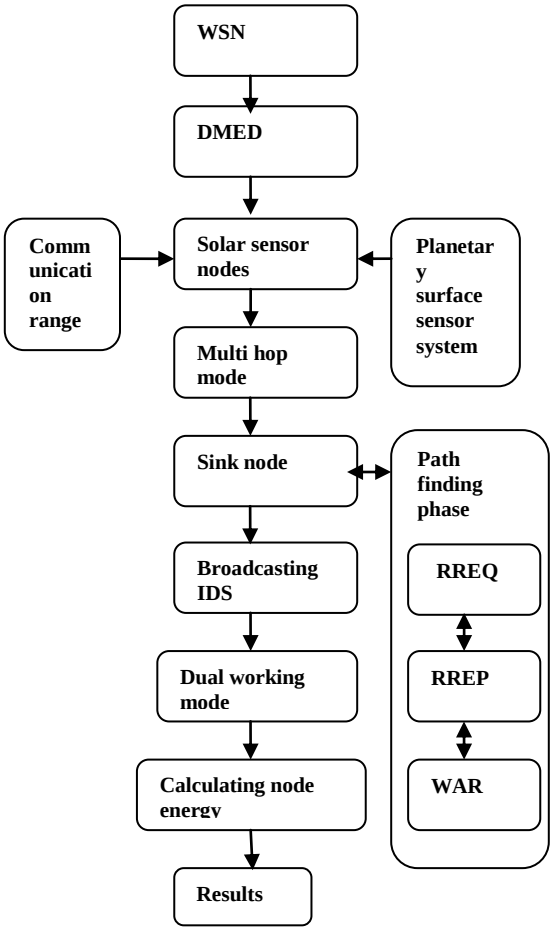

FIGURE 2: ARCHITECUTRE OF DMED

III. OBJECTIVES & OVERVIEW OF THE PROPOSED MECHANISM

A. Objectives

In this paper, we propose to implement a new protocol named as dual mode energy driven routing protocol with

energy balancing considerations. Energy efficiency and energy balancing is the main aim of the DMED protocol. DMED balances the route stability and energy consumption. Simulating the DMED using the tool NS2.

- Long life time.
- Better Power Consumption
- Optimal Routing
- Energy balancing
- Easy handling of data congestion.
- Efficient packet delivery

B. Overview ofthe proposed Mechanism

The DMED protocol mainly contains four steps

1) Route Request

2) Route Reply

3) Jammers node detection

4) Finding the Shortest Path

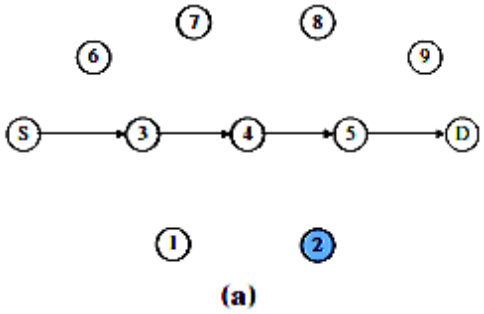

Figure 3: The regular route checking mechanism

(a)The first path finding process

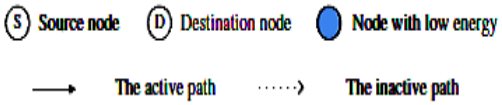

Figure 3(a): shows the regular route checking mechanism in this case the DMED does not maintain the same paths at the same time.There are several problems for this. If the data transmission are large then the energy of the working nodes will be cut down and sometimes energy consumption of the nodes will be invalid. To overcome this problem regular route checking mechanism is to be used ,in this first computer its path then selects the energy

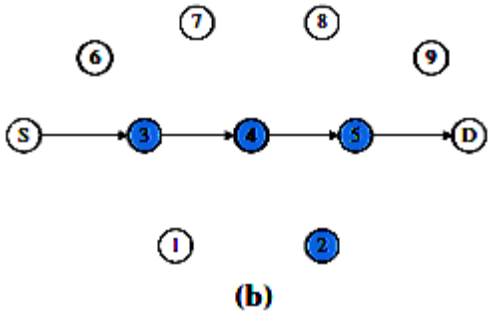

Figure 3 (b) . Energy Consumption

The Figure 3(b) shows the energy of the nodes, S is the source and D is the destination nodes .After computing the shortest path, select the energy randomly the nodes named as 3,4 and 5.If the nodes are working long time with this path the path is decreasedvery shortly then the path is not suitable for the data transmission or packet delivery of the data packets.Energy consumption is the optimal and efficient way of energy usage in the different nodes.Dual mode energy driven routing protocol is the energy driven routing protocol and energy conserving protocol and specially implemented for the energy balancing and at the same time improving the energy efficiency and avoiding the energy loss problem and overcome all the disadvantages of the existing protocol AODV.

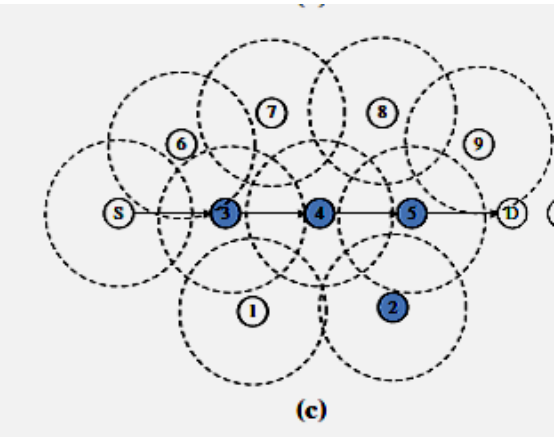

Figure 3(c) The regular broadcasting mechanism

Figure3 (c) shows the regular broadcasting mechanism, and it is the method of finding the hop counts.and it helps to maintain the energy in the different nodes. In this regular broadcasting mechanism, the DMED recalculates the value of weighted average of reciprocals and to find the efficient and suitable path and this path will be chooses as the next path for DMED. The following figure shows the calculating the hop count for each nodes in the dual mode energy driven routing protocols.

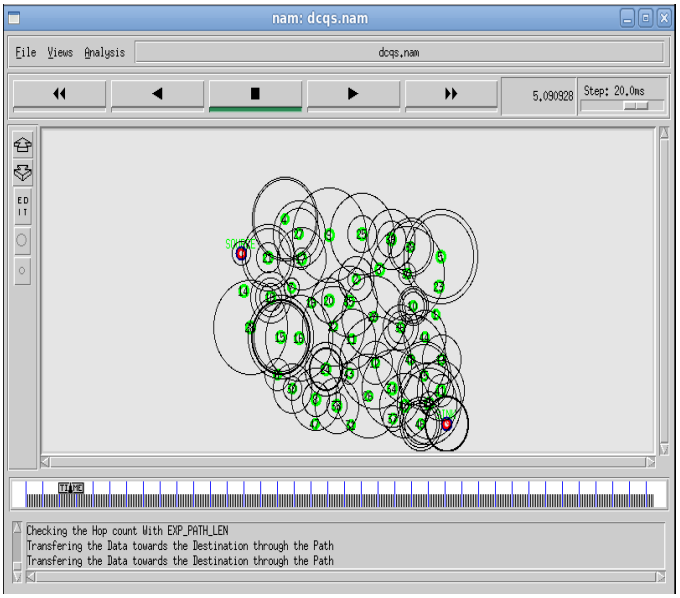

Figure 3 (d) : Calculating the Hop count

There are 50 nodes are initialized in the above figure. After the initialization of the 50 nodes, assign the source node and destination node. Source node is the starting node and sink node is the destination node. Then to find the shortest path between the source node and sink node. There are several methods for calculating the shortest path between two nodes. We use dijikstras algorithms for calculating the shortest path between two nodes. Then we calculate the node energy of each nodes Network animator (nam) is used for implementing this protocol.

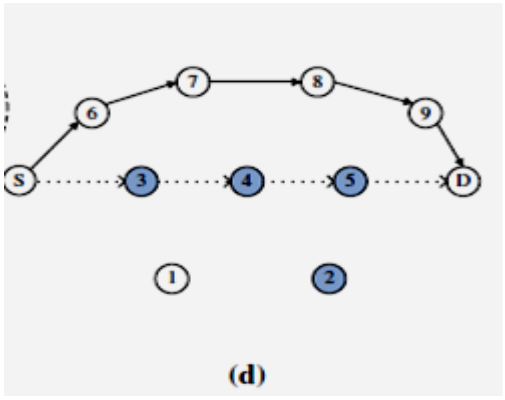

Figure 3(e) The Route Switching Process

Figure 3(e) shows the Route switching process and Route switching process take part of the next mile stone of the dual mode energy driven routing protocol. S->6->7->8->9->D is the path in the above figure.The path which is shown in the figure is the optimal path and it is based on the route switching principle.Because of the Route checking process, DMED maintains efficient and nice energy balancing performance with energy balancing considerations.

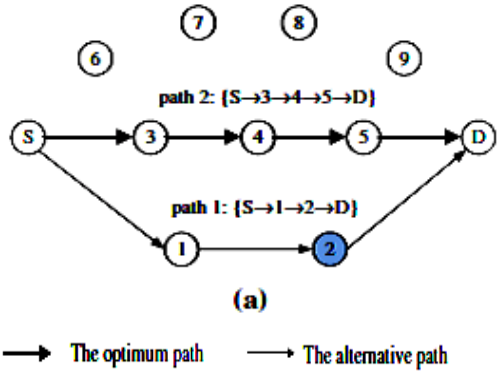

Figure 4(a): The path finding process under the day mode

Figure 4(a) describes the path finding process under the day mode and it contains two paths the optimum path and the alternative path .Node 2 is selected as the lower energy node in the above figure and the path1 {S->1->2->D} can be chooses as the alternative path because it has the minimum hop counts.

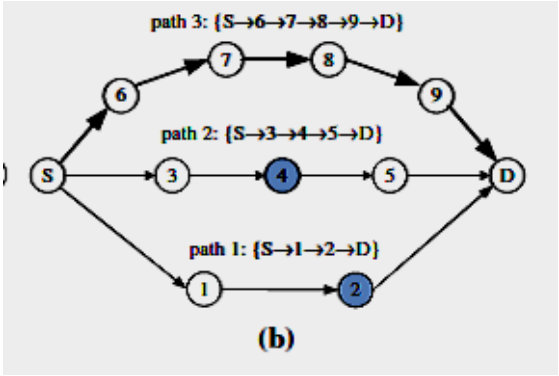

Figure 4(b)The path finding process under the night mode.

Figure 4(b) shows the path finding process under the night mode and it may contain 3 paths,path1 and path 2 and path3.In the planetary surface sensor system so many solar batteries are equipped, these solar batteries are used for battery charging, Under the night mode there is no solar energy for battery charging so the energy of each node is dropped sharply. To avoid this problem the route finding process under the night mode is to distribute the traffic burden into more number of nodes, in this the path which has the sufficient energy is inclined to be chosen.

The energy of the node 2 is not enough and path 3 is to be find the optimal one according to the WAR routing consultation mechanism. S->6->7->8->9->D, path 3 is the optimal path in the figure 4(b).When dealing with the three route request (RREQ) messages under the night mode,the route is to be switched one or two times to find the optimal and suitable one with enough energy and this real time routing process does not affect the data transmission process.

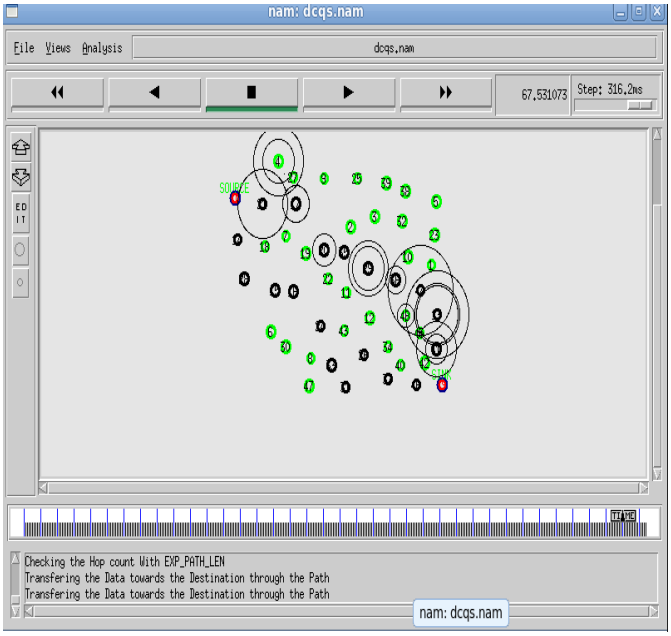

FIGURE 5: SIMULATION OF THE ROUTE FINDING PROCESS UNDER THE NIGHT MODE

IV. PERFORMANCE EVALUATION

A. *Simulation Model and Parameters*

We use NS2 to simulate our proposed algorithm. In our simulation, 150 mobile nodes are participated in the communications. The simulated traffic is Constant Bit Rate (CBR). Maximal transmission range 250 meters and the packet size is 1024 bytes.In this paper the performance of the AODV Protocol is compared with the DMED Protocol and the analysis, simulation and the experiments shown that the DMED routing protocol is the most useful and most effective routing protocol in the conventional wireless sensor networks and experiments shows that DMED is the most efficient protocol for wireless planetary exploration and DMED helps to improve the energy efficiency and to maintain the energy balancing in the wireless sensor networks.

Simulation is the real time implementation of the real world objects or modeling of the objects. The Simulation settings and the simulation parameters are described in the Table1.The experimental Tool is NS-2 it is the most important simulation tool which is universally accepted multiprotocol simulation software and it is developed by the DARPA and it is supported by the Virtual InterNetTestBed and NS-2 is the most commonly used simulation tools.The radio propagation model use two ray ground and it is commonly used in the mobile scenarios.

Our simulation settings and parameters are summarized in table 1.

Table 1 The Simulation Settings

Simulation parameter	value
Simulation	NS-2(version 2.35)
Channel	Wireless
MAC layer Protocol	802.11
Network range	1.500m*1.500m
Number of nodes	150
Initial energy of each node	20 nj
Maximal transmission range	500 m
Radio propagation model	Two ray ground
Maximal packet rate	60
Packet size	1024byte
Traffic type	CBR(constant bytes rate)
Mobility model	Random way point

V. VALIDATION OF ENERGY BALANCING

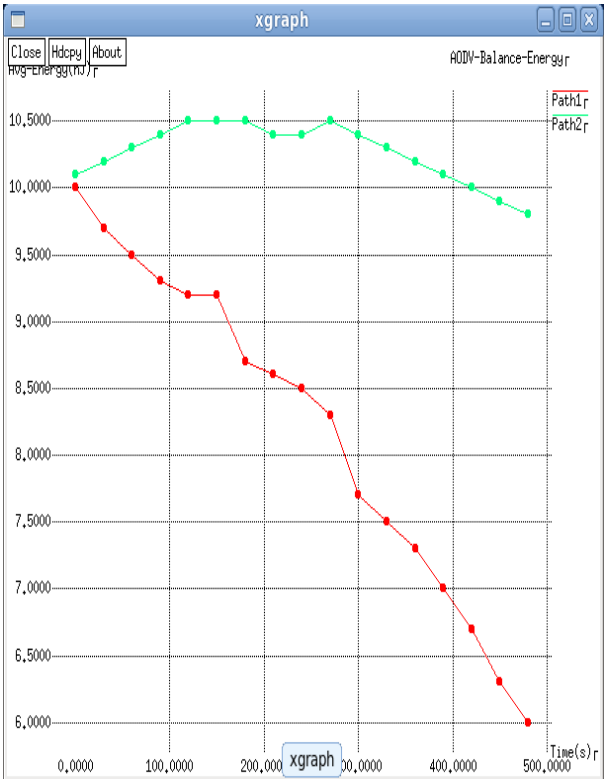

Figure 6: Energy balancing graph of the AODV

The energy balancing considerations of the AODV is shown in the above figure 6.In the experiments the simulation scene is taken as 500 . Then day mode and night mode occupy 250 respectively and both graphs is shown in the following figures. In the rechargeable battery factor=0.02 and discount rate r=0.02.Then energy balancing considerations of the DMED and AODV is compared and to find the better performance of these protocols.

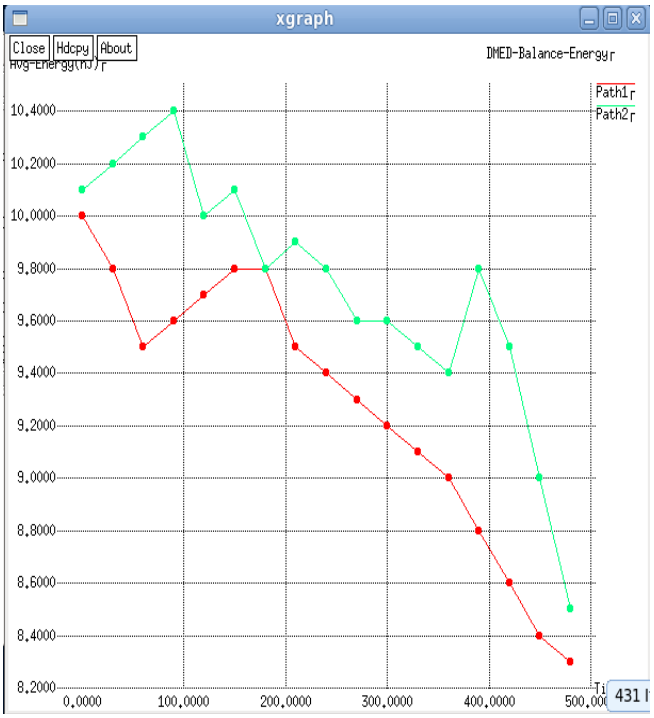

Figure 7 : Energy balancing graph of the DMED

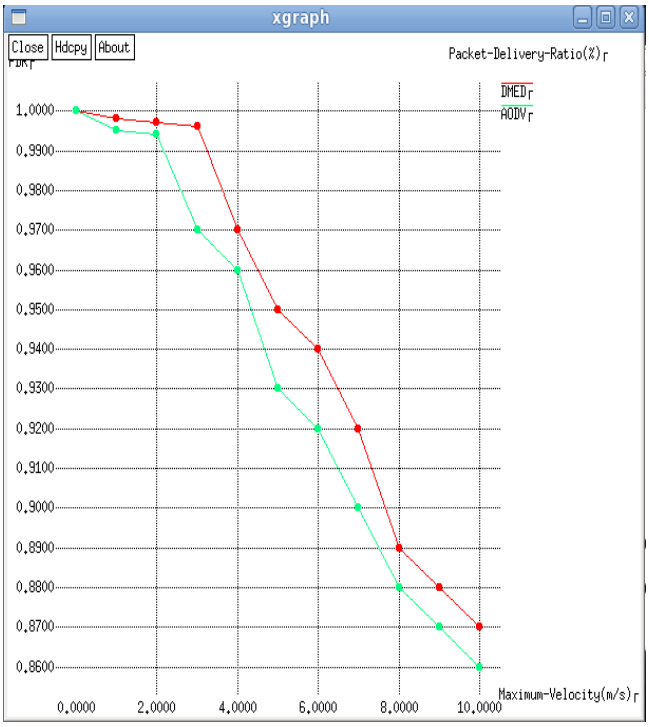

Figure 8: Packet delivery ratio of the DMED and AODV

The energy balancing performance in the DMED is shown in the figure 7.The path1 indicates the night mode and it is indicates with the red line and path2 is the day mode and iti is indicated with the green line and the graph shows the overall energy balancing performance in 500s.In the comparison of AODV and DMED ,DMED shows that it is more useful and efficient energy balancing performance and it is used to maintain the energy in the night mode and AODV is less energy balancing considerations comparing the DMED.

VI. PACKET DELIVERY RATIO

The packet delivery ratio of the DMED and AODV is to be shown in the following figure 8.The packet delivery ratio is the ratio between the packets and its delivery.Packet delivery ratio is referred to as the ratio of the number of the successfully delivered data packet to the destination.To evaluate the protocol performance packet delivery ratio is to be used.If the packet delivery ratio is the greater value then it is the better performance of the routing protocol. The performance comparison of DMED and AODV is shown in the figure. The red line indicates the packet delivery ratio of the dual mode energy driven routing protocol and the green line indicates the packet delivery ratio of the adhoc on demand distance vector routing protocol.

VI. CONCLUSION

. This paper is presented for the analysis and simulation of the dual mode energy driven routing protocol and at the same time it is improving the energy efficiency and performing the energy balancing in the wireless sensor network for the planetary exploration.Planetary exploration is the exploration of the planetary systems and collecting its different information's.There are mainly two modes are to be used in the DMED protocol, the day mode and the night mode.the day mode is the charging state and the night mode is the sleeping state.

The wireless sensor network are the most important sensing network which is contained different sensor node and each node capable of sensing the environmental conditions such as temperature and pressure.The routing protocols helps to find the most suitable and optimal path between the different nodes in the computer network.Adhoc on demand distance vector routing protocol is the existing routing protocol and it has several disadvantages like connection set up delay is lower,unnecessary bandwidth,High rate of energy consumption,difficult to send the data packets.To overcome all the disadvantages of the adhoc on demand distance vector routing protocol, The DMED is developed.The analysis and simulation of the DMED shows that the DMED is the most useful protocol for planetary exploration.

REFERENCES

[1] Dargie,W(2011)," dynamic power management in wireless sensornetworks: state of the art " *IEEE sensors Journal 12(5),1518-1528.*

[2]Dubois..Botteron,c.,Mitev.,et al(2009) "Adhoc wireless sensor networks for exploration of solar system bodies" ,*Acta Astronautica,64(5-6),626-643*

[3] Durga Prasad, K., &Murty, S. V. S. (2011)."Wireless sensor networks a potential tool to probe for water on Moon. *Advances in Space Research", 48(3), 601–612*

[4] Marina, M. K., & Das, S. R. (2006). "Ad hoc on-demand multipath distance vector routing. *Wireless Communications and Mobile Computing", 6, 969–988.*

[5]Zarifzadeh, S., Nayyeri, A., Yazdani, N., et al. (2009). "Joint range assignment and routing to conserve
Energy in wireless ad hoc networks". *Computer Networks*, *53*(11), 1812–1829.

[6]Vidhyapriya, R., &Vanathi, P. T. (2007)."Energy aware routing for wireless sensor networks".In*Proceedings of international conference on signal processing, communications and networking* (pp. 545–550)".

[7]Jiahui Hu · Xianwei Zhou · Yi Xie·(2013)Wei LiuDMED:" A Dual-Mode Energy-Driven Routing Protocol for Wireless Planetary Exploration Sensor Network"

[8]Sanmartin, J. R., Charro, M., Lorenzini, E. C., et al. (2008). "Electrodynamic tether at Jupiter–I: Capture operation and constraints. *IEEE Transactions on Plasma Science*, *36*(5), 2450–2458"

[9]Ratnakumar, B. V., Smart, M. C., Kindler, A., et al. (2003)." Lithium batteries for aerospace applications:2003 Mars Exploration Rover. *Journal of Power Sources*, *119–121*, 906–910"

[10]Del Re, E., Pucci, R., &Ronga, L. S. (2009). IEEE802.15.4 wireless sensor network in Mars exploration scenario. In *Proceedings of international workshop on satellite and, space communications* (pp. 284–288).

[11] Chang, J.-H., &Tassiulas, L. (2000). "Energy conserving routing in wireless ad-hoc networks." In *Proceedingsof IEEE INFOCOM* (pp. 22–31)"

[12] Perkins, C., Belding-Royer, E., & Das, S. (2003). "*Ad hoc on-demand distance vector (AODV) routing,"RFC 3561*, July.http://tools.ietf.org/html/rfc3561

Authors Profile

S. SaravanaKumarreceived his B.E. degree in computer science and engineering from the Dr MahalingamCollege of Engineering,pollachiAffiliated to Anna University, Chennai, India,.M.E. Computer Science and engineering From Sasurie college of Engineering,Affiliated to Anna University Chennai, TamilnaduIndia. He is presently workingas Assistant Professorin, Department of ME(Computer Science and Engineering) at SVS college of Engineering,Coimbatore,Tamilnadu,India. His research interest includes Artificial Intelligence and Wireless Networks.

NeethuPrabhakaran P received herDiploma in computer EngineeringfromWomen's polytechnic college, Nedupuzha,Thrissur, kerala and BTechdegree in computer science and engineering from IES college of engineering,Chittilappilly,Thrissur,Affliated to Calicut Universitykerala, India.Currently doing M.E. in Computer science and Engineering at SVS college of Engineering ,Coimbatore,TamilnaduIndia. Her research interest includes Wireless Sensor Networks, Mobile Ad hoc networks, Image Processing.