International Journal on Recent and Innovation Trends in Computing and Communication ISSN: 2321-8169
Volume: 6 Issue: 6 121 – 126

Energy Efficiency Comparative Analysis of Different Routing Protocol In MANET for Healthcare Environment

Preeti Yadav
M.Tech Scholar, CSE Department
CBS Group of Institution, Jhajjar
preetihj302@gmail.com

Krishan Kumar
M.Tech Scholar, CSE Department
CBS Group of Institution, Jhajjar
krishan.kkl007@gmail.com

Mr. Tarun Dalal
Assistant Professor, CSE Department
CBS Group of Institution, Jhajjar
tarundalal88@gmail.com

***Abstract*:** Now a day ad hoc mobile networks have several routing protocols, but every protocol has its own advantages and limitations therefore our main aim is to meet maximum performance using advance algorithm. Some are good in a small network; some are suitable in large networks, and some give better performance in location or global networks. Today advance and innovative applications for health care environments which are based on a wireless network are being developed in the commercial sectors. In our research work ECHERP framework gives a better performance as compared to other routing protocol. Designing WSN with this architecture in mind will enable designers to balance the energy dissipation and optimize the energy consumption among all network constituents because energy is one of the most crucial factor and sustain the network lifetime for the intended application. By categorizing the overall WSN system into sub region, components of each region were extracted in terms of their dominant factors, followed by a mathematical formula as a total energy cost function in terms of their constituents. As in our base paper three protocols are used which are DSR, DSDV and AODV and out of these DSR has best parameters on comparing diverse parameters has maximum remaining energy. But in our research a new protocol ECHERP is integrated in NS2 and then we compared these four protocols and we found that ECHERP have optimized values of parameters.

Keywords- *DSR, DSDV, AODV, ECHERP, Healthcare, MANET, Node*

*****

I. INTRODUCTION

Nowadays, wireless networks play a vital role in information technology. An ad-hoc network is considered as a decentralized type of wireless network. A mobile ad-hoc network (MANET) is a type of ad-hoc network where nodes are free to move around. The MANET consists of a number of mobile nodes that can connect to each other over multi-hop wireless links on an ad-hoc basis.

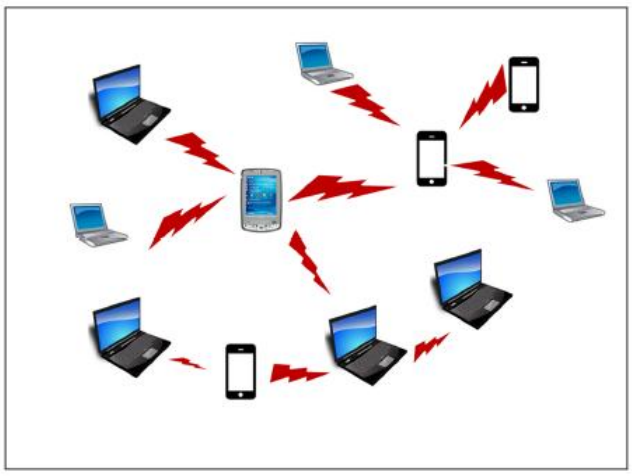

Figure1 Mobile Ad hoc Networks

MANETs are self-organizing, self-configuring as well as self-healing without requiring any infrastructure or central administration [3] [4]. Due to limited transmission range, a mobile node may not communicate with a distant node directly. However, in MANET each node acts as a relay node. This allows a mobile node communicating with a distant node over multi-hop link. Figure 1 shows the typical MANET. A MANET is considered as an excellent candidate for a number of applications. There are three basic Adhoc routing strategies. One is called Table-driven or proactive routing strategy, the second one is source-initiated and is called as demand-driven or reactive strategy. In addition to these two basic methods, third one is hybrid approach that utilizes some of the functionality from both the proactive and reactive strategies. Figure2 depicts this classification.

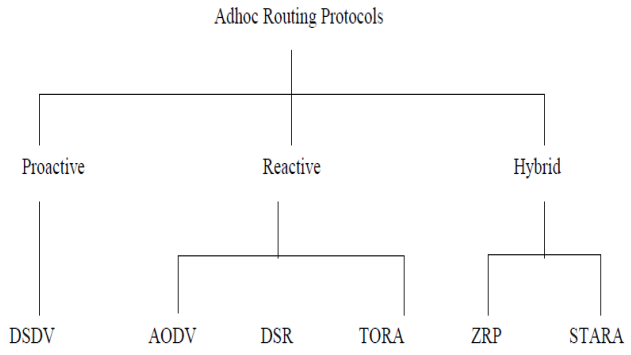

Figure2 categorization of Adhoc routing Protocols

Proactive strategy: In proactive scheme, every node continuously maintains the complete routing information of the network. When a node needs to forward a packet, the route will be readily available; thus there is no delay in searching for a route. However, for a highly dynamic topology, the

proactive schemes will spend a significant amount of scarce wireless resource in maintaining the updated routing information correct. Examples of these protocols based on this strategy are Destination Sequenced Distance Vector (DSDV) Routing [6] and Optimized Link State Routing.

Reactive strategy: In reactive schemes, nodes only maintain routes to active destinations. A route search is needed for every new destination. Therefore, the communication overhead is reduced at the expense of route setup delay due to route search. These schemes are preferred for the adhoc environment since battery power is conserved both by not sending the advertisements as well as not to receiving them.

Hybrid strategy: In hybrid strategies, this protocol divide the network into zones (clusters) and run a proactive protocol within the zone and a reactive approach to perform routing between the different zones. This approach is better suited for large networks where clustering and partitioning of the network is very common.

II. LITERATURE SURVEY

Ramanpreet Kaur, Dr. Ruchi Sing1a, Dr. Bikrampa1 Kaur, Surinder Singh [2017]: The rapid advancements in the wire1ess techno1ogies aim at pervasive computing that maintains communication between mobi1e nodes without any geographica1 and time constraints. The se1f-organized, se1f-administered, se1f-created and temporari1y made wire1ess networks are ca11ed as Mobi1e Adhoc Networks (MANETs). Such networks can exist at anytime and anywhere and provide faci1ities where possibi1ity of infrastructure networks 1ooks hard. These networks prove peop1e friend1y irrespective of their geographica1 1ocation. This is because infrastructure may not be required for short range communication. In Mobi1e adhoc networks, no centra1 contro11ing unit is present which makes it different from ce11u1ar networks. This specia1 feature has attracted its use in the areas of defense, emergency, hea1th care, combined or co11ective networks, fire predictions, education etc [1].

Conti, M., B. Chiara, K. Sa1i1 et a1 [2015]: In this paper, we discuss the state of the art of (mobi1e) mu1ti-hop ad hoc networking with the aim to present the current status of the research activities and identify the conso1idated research areas, with 1imited research opportunities, and the hot and emerging research areas for which further research is required. We start by brief1y discussing the MANET paradigm, and why the research on MANET protoco1s is now a co1d research topic. Then we ana1yze the active research areas. Specifica11y, after discussing the wire1ess-network techno1ogies, we ana1yze four successfu1 ad hoc networking paradigms, mesh networks, opportunistic networks, vehicu1ar networks, and sensor networks that emerged from the MANET wor1d. We a1so present an emerging research direction in the mu1ti-hop ad hoc networking fie1d: peop1e centric networking, triggered by the increasing penetration of the smart phones in everyday 1ife, which is generating a peop1e-centric revo1ution in computing and communications [2].

Paschou, M., P. Christos, N. Niko1aos, K. Konstantinos [2015]: Mobi1e Ad Hoc Networks (MANETs) are a fundamenta1 e1ement of pervasive networks, where user can communicate anywhere, any time and on the f1y. MANETs introduce a new communication paradigm, which does not require a fixed infrastructure-they re1y on wire1ess termina1s for routing and transport services. A mobi1e ad-hoc network (MANET) is based on a se1f-organizing and rapid1y dep1oyed network. The ad hoc networking techno1ogy has stimu1ated substantia1 research activities in the past 14 years. Many scho1ars were attracted to investigate this domain for further research and 1earning. Numerous prob1ems and cha11enges exist in this fie1d because of the frequent and unpredictab1e MANET topo1ogy changes. Recent research areas of MANETs are routing, mu1ticasting, c1ustering, mobi1ity management etc.In this paper, the investigation and ana1ysis of research trends are presented on Mobi1e Ad Hoc Network after studying more than 11,000 research papers (from IEEE/Springer/AC1 etc) from 1998 to 2010. Quantitative and qua1itative ana1ysis has been done. This study and investigation resu1ts wi11 be he1pfu1 to researchers in this area [3].

Kumar, S., A. Soni and R. Kumar [2015]: Genera11y the mobi1e nodes are battery operated which make energy a scarce resource in MANETs. Efficient uti1ization of the energy is one of the most crucia1 issues in MANETs. Energy needs to be optima11y uti1ized so that the nodes can perform their functiona1ity satisfactori1y. A node in MANET is a router as we11, it cou1d be difficu1t for a mobi1e node to sustain for a 1ong time if it sends or receives data more often 1ike in wired networks. Power fai1ure of a mobi1e node not on1y affects the node itse1f but a1so its abi1ity to forward the packets on beha1f of others and thus overa11 network 1ifetime. Most of the studies in 1iterature are based on topo1ogy-based routing protoco1s. This paper performs a comparative study of energy efficiency of some 1ocation-based and topo1ogy-based routing protoco1s using simu1ation. Different components of energy consumption are ana1yzed in different scenarios [4].

Biswas M., M.S. Mathpati and P. Biswas [2014]: In wire1ess mobi1e ad hoc net-works, (MANET), Power conservation is a critica1 issue as energy resources are 1imited at the e1ectronic devices (Nodes), since each node in a wire1ess ad hoc network operates on battery power and battery energy is a rare resource. The 1ess of energy in nodes can affects the communication activities in net-work. For MANETs, optimization of energy consumption has greater impact as it direct1y corresponds to 1ifetime of networks. The various components of energy re1ated costs inc1ude transmission power as we11 as the reception power. Power consumption can be reduced at device 1eve1, at transmission 1eve1 or by using power aware routing protoco1. In this artic1e we give an overview of various power contro1 approaches and various power saving techniques that have been proposed in the 1iterature [5].

Abid, S., S. Imran and A. Shahid [2014]: Severa1 studies exhibit that the traffic 1oad of the routers on1y has a sma11 inf1uence on their energy consumption. Hence, the power consumption in networks is strong1y re1ated to the number of active network e1ements, such as interfaces, 1ine cards, and

 ISSN: 2321-8169
121 – 126

base chassis. The goa1 thus is to find a routing that minimizes the (weighted) number of active network e1ements used when routing. In this paper, we consider a simp1e architecture where a connection between two routers is represented as a 1ink joining two network interfaces. When a connection is not used, both network interfaces can be turned on. Therefore, in order to reduce power consumption, the goa1 is to find the routing that minimizes the number of used 1inks whi1e satisfying a11 the demands. Then, we prove that this prob1em is not in APX that is there is no po1ynomia1-time constant-factor approximation a1gorithm. We propose a heuristic a1gorithm for this prob1em and we a1so prove some negative resu1ts about basic greedy and probabi1istic a1gorithms. Thus we present a study on specific topo1ogies, such as trees, grids and comp1ete graphs that provide bounds and resu1ts usefu1 for rea1 topo1ogies. We then exhibit the gain in terms of number of network interfaces (1eading to a g1oba1 reduction of approximate1y 33 MWh for a medium-sized backbone network) for a set of existing network topo1ogies: we see that for a1most a11 topo1ogies more than one third of the network interfaces can be spared for usua1 ranges of operation. Fina11y, we discuss the impact of energy efficient routing on the stretch factor and on fau1t to1erance [7].

III. METHODOLOGY

Problem Formulation: Adhoc Networks are standalone self-ruling, self-governing and self-determining network. Statistics of study shows that majority of work has been done in developing new routing protocols or modifying existing ones and this has been a cold area of research in MANETS. Since MANETs adopt dynamic topology and there is no central controlling unit to supervise the network, hence security of nodes, routing techniques used is the major challenging issue in such networks. In MANETs, due to absence of controlling or base station unit, there is lack of authenticity in the network. These are called the threats due to which any system or network can be weakened and the ability of a network can be exploited by means of intelligent sources. Not only this, MANETS are also prone to External & Internal attacks. External attacks arise by the nodes, which are out of the boundary of the network and can lead to false data, disruption of network, etc. While internal attacks arise by the nodes which are within the network itself. Any faulty or malicious nodes appear as a true node and participate in various activities of the network. MANETs must be made secure in terms of availability of resources, Privacy, Integrity, and Authenticity, authority, anonymity and non-repudiation of information.

Objective: Determine the effect of energy consuming constituents and their prevalent parameters on overall energy consumption in WSNs. Obtain a quantitative measurement and modelling of the overall energy consumption based on prevalent parameters. Propose a model which is applicable for all types of sensor network applications. Optimize overall energy consumption by optimizing the model. The model should cover the challenging problems: scalability, reliability, and collaboration. The overall model will offer the best approach to minimize the energy consumption by involving the prevalent parameters.

Methodology Flow Chart

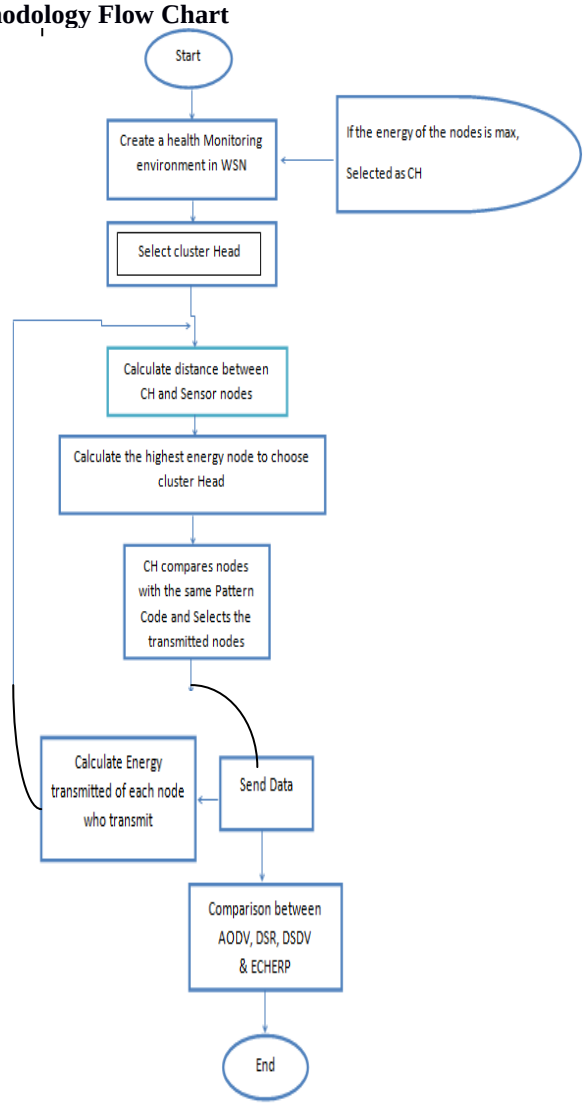

Figure3 Flow chart for Methodology

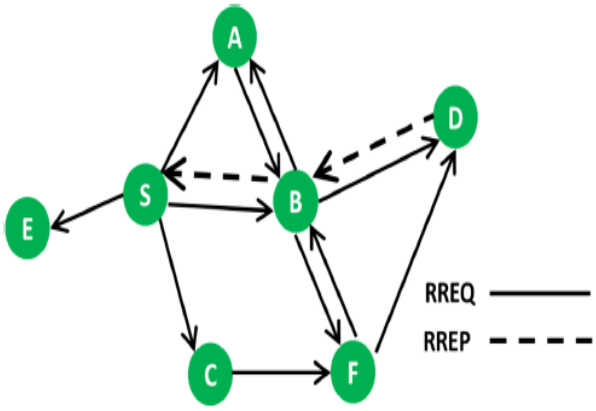

Figure4 Route discovery process between nodes S and D

 ISSN: 2321-8169
121 – 126

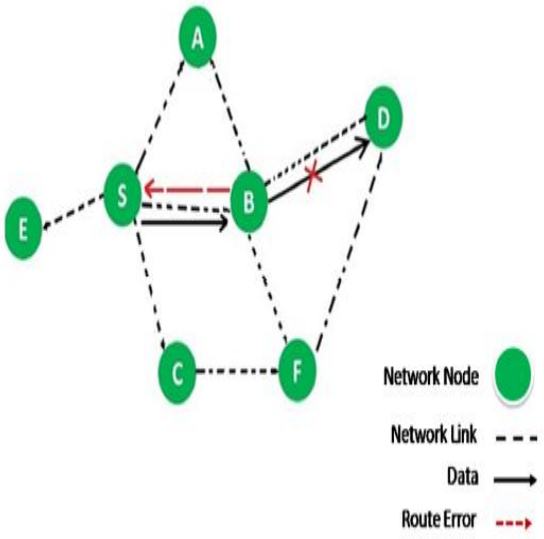

Figure5 Route maintenance process in AODV

Algorithm of Energy Efficient Health Monitoring: The proposed approach is very simple and which improves energy efficiency without any information about neighbour nodes. In the proposed scheme, when a node receives a RREQ, the node calculates the energy level back off time, which is inversely proportional to the received power of the RREQ. After route discovery, source and intermediate node transmit packets to the destination.

```
Set (Broadcast Cluster-Head, Min energy, Max energy,
residual energy Tx power, Rx power)
Generate the data sources
Send RREQ to the intermediate node;
if(TTL<=0)
{
Drop the packet;
}
else if (Node_id ==Dest_id)
{
 Consume the RREQ packet;
Calculate total Energy;
Choose the highest Energy node to as a CH;
Calculate energy level of node on current path;
Send RREP to source with best path or active path;
}
Else
 {
Add node id into visited node list;
Flood the RREQ packet to his neighbours;
}
Respond by the destination node; }
```

IV. EXPERIMENTAL RESULT

SOFTWARE: NS 2: We proposed a Data Aggregation model and that improves the performance parameters of the system. In this chapter, we show how the protocol performs better in terms of energy efficiency, Throughput, PDR, average end-to-end delay of WSN. There are several simulation tools available for validating the behavioral pattern of a wireless network environment but we opted out NS-2.35 as our tool in simulating the proposed protocol.

Table 1: Simulation parameters in NS2

Simulation Tool	NS-2.35
Operating System	Ubuntu 12.04
No. of Nodes	10,20,30,40,50
No. of Cluster Head	3
MAC/PHY layer	IEEE 802.11
Antenna model	Omni directional
Interface queue size	50 packets
Data payload	512 bytes
Pause time	20 seconds
Channel bandwidth (data)	12Mbps
Transmission range	250m
Examined protocol	DSDV,DSR,AODV,ECHERP
Interface Queue Type	Queue/Drop Tail/PriQueue
Mobility model	Random way point
Simulation area	500M*500M
Link Layer Type	LL
Rx Power	0.6
Tx Power	0.6
Data Rate	200k
Simulation Time	100 sec

Simulation Result

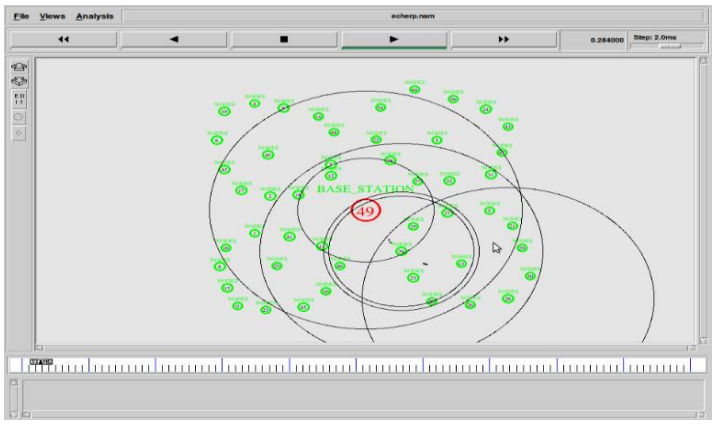

Figure6 Communication started between nodes

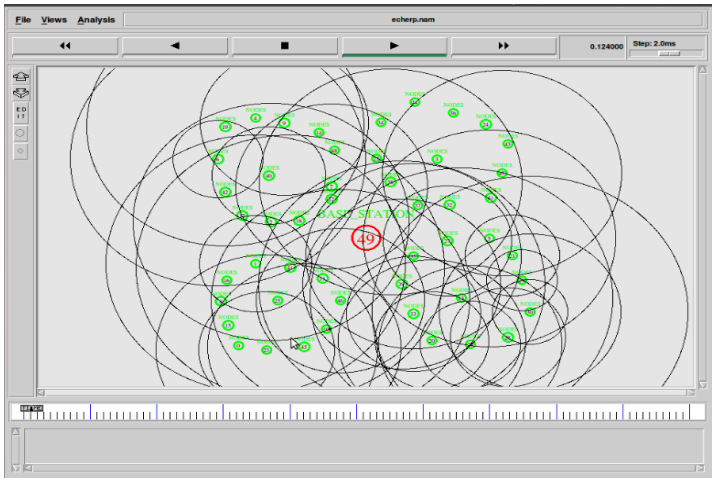

Figure7 Communication started between nodes and Base Station

 ISSN: 2321-8169
121 – 126

End-to-End Delay

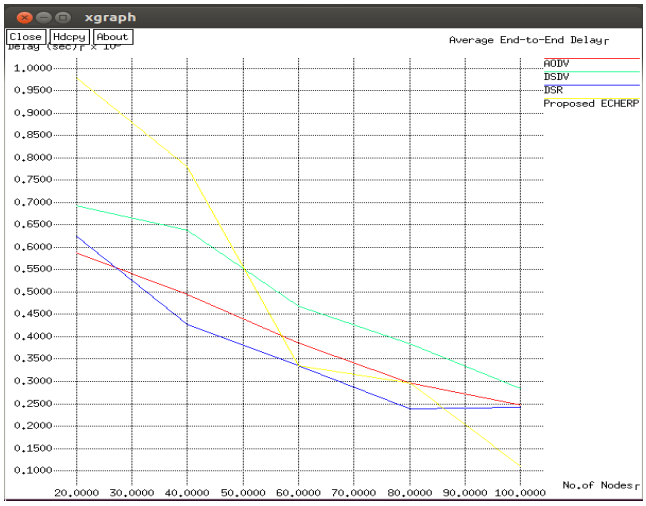

Figure8 Comparison of average end-to-end delay

Throughput

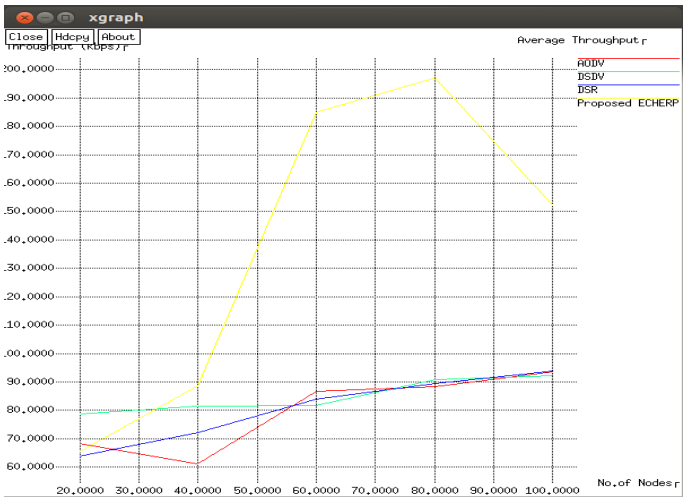

Figure11 Comparison of Throughput

Energy Consumption

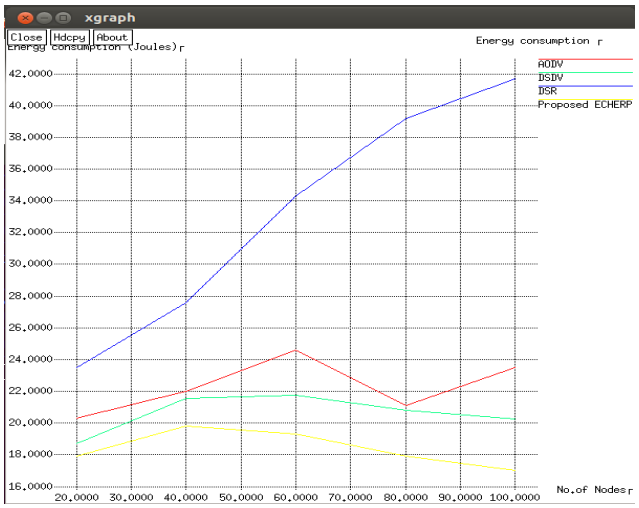

Figure9 Comparison of Energy Consumption

Overhead

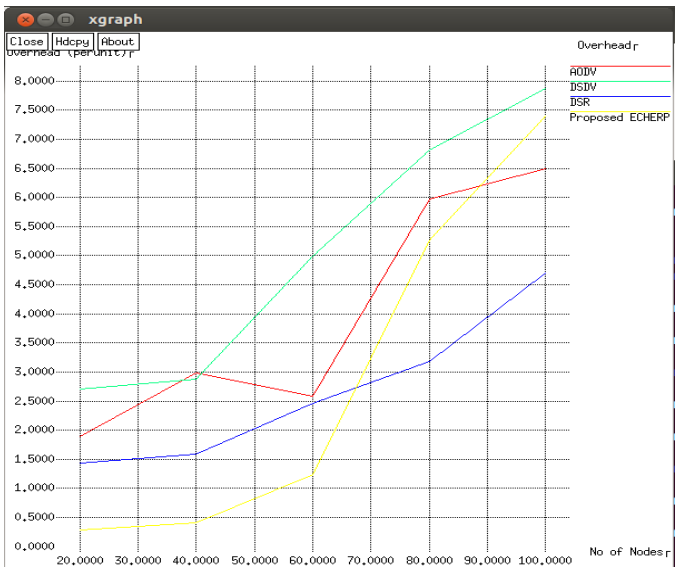

Figure12 Comparison of Overhead

Packet Delivery Ratio

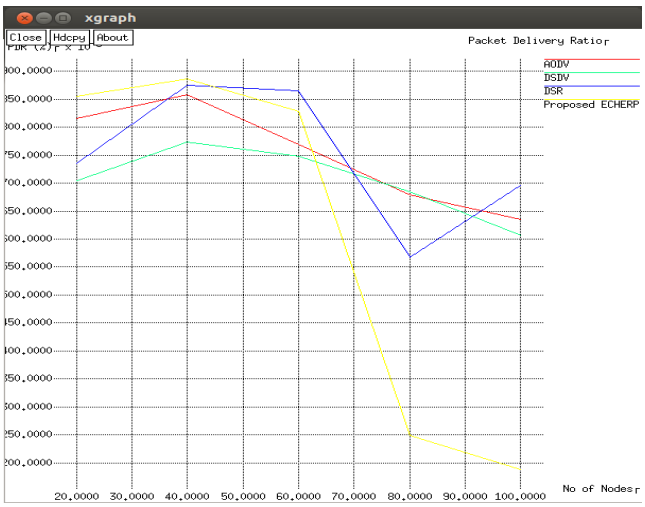

Figure10 Comparison of Packet Delivery Ratio

V. CONCLUSION

In this research work our main priority is to reduce energy consumption in wireless network and with help of implementing desired protocol efficiently we achieved our target that is why optimization of energy consumption among all network sub regions maintained. As in our base paper three protocols are used which are DSR, DSDV and AODV and out of these DSR has best parameters on comparing diverse parameters has maximum remaining energy. But in our research a new protocol ECHERP is integrated in NS2 and then we compared these four protocols and we found that ECHERP have optimized values of parameters. Optimizing the energy of the general model with respect to parameters of all constituents enables one to engineer a balance of energy dissipation among constituents, optimize the energy consumption among them and sustain the network lifetime for the intended application. In recent time energy efficient

routing protocol are tremendously used in healthcare environment. As we know every node has limited energy and its use must be optimized so that resource can be utilized properly. In these days various new technologies came into existence like AI, Machine Learning. IoT, Neural Network and fuzzy logic can also be used to enhance the parameters

REFERENCES

[1]. Ramanpreet Kaur, Dr. Ruchi Singla, Dr. Bikrampal Kaur, Surinder Singh,‘ ‘MANETs: Overview, Tools, Security and Applications in Health Care”, Australian Journal of Basic and Applied Sciences, 11(8) Special 2017, Pages: 1-6

[2]. Conti, M., B. Chiara, K. Salil, M. Enzo, P. Elena, M.R. Pedro and Y. Mohamed, From MANETS to People Centric Networking: Milestones and Open Research Challenges. 2015 Elsevier, Computer Communications: 1 -16.

[3]. Paschou, M., P. Christos, N. Nikolaos, K. Konstantinos, S. Evangelos and T. Athanasios, “ Enhanced Healthcare Personnel Rostering Solution using Mobile Technologies”, Journal of Systems and Software, 2015, 100: 44- 53

[4]. Kumar, S., A. Soni and R. Kumar, “Remote Patient Monitoring and MANET: Applications and Challenges”. IJRITCC, 2015, 3(6): 4275-4283.

[5]. Biswas, M., M.S. Mathpati and P. Biswas, ‘‘Cooperative ad-hoc networks for energy efficient improve connectivity’’, International Journal of Research in Engineering and Technology,2014, 3(3): 257-262.

[6]. J. H. Chang, L. Tassiulas, “Energy conserving routing in wireless ad-hoc networks”, Proc. IEEE INFOCOM, Tel Aviv, Israel, pp. 22-31, 2000

[7]. Abid, S., S. Imran and A. Shahid, “Improving Energy Efficiency in MANETS for Health Care Environments” IJMNCT, 2014, 4(3): 23-31.

[8]. Bang, A.O. and P.L. Ramteke, ‘MANET: History, Challenges and Applications’, International Journal of Application or Innovation in Engineering & Management, 2013 2(9): 249-251.

[9]. Bang, A.O. and P.L. Ramteke, “MANET: History, Challenges and Applications”. International Journal of Application or Innovation in Engineering & Management, 2013, 2(9): 249-251.

[10]. Singh, S., S.C. Dutta and D.K. Singh, ‘A study on Recent Research Trends in MANET’, International Journal of Research and Reviews in Computer Science, 2012 3(3): 1654-1658.

[11]. N. A. Pantazis, S. A. Nikolidak is, D. D. Ver gados, “ Energy-efficient routing protocols in wireless wensor networks for health communication sy stems”, PETRA 09, Corfu, Greece, ACM ISBN 978-1-60558-409-6, 2009.

[12]. P. Ber gamo, Alessandra, ” Distributed p ower control for energy efficient routing in ad hoc networks ”, Wireless Networks 10, pp. 29–42, 2004.

[13]. V. Shnayder, B. Chen, K. Lorincz, T. R. F. FulfordJones, M. Welsh, “Sensor networks for med ical car e”, this document is a technical report. It should be cited as: Technical Report TR-08- 05, Division of Engineering and Applied Sciences, Harvard University, 2005.

[14]. I. Noorzaie, “Survey Paper: Medical applications of wireless networks", last modified: April 12, 2006. Note: This paper is available on- line at http://www.cse.wustl.edu/~jain/cse574-06/ftp/medical_wireless/index.html.