www.ijemr.net ISSN (ONLINE): 2250-0758, ISSN (PRINT): 2394-6962

Volume-7, Issue-1, January-February 2017

International Journal of Engineering and Management Research

Page Number: 100-106

Analysis of Energy Routing Protocol with Power Consumption Optimization in MANET

Amruta Indapurkar[1], Rohini Patil[2]

[1]Department of Computer, Mumbai University, Terna Engineering College, INDIA

[2]Assistant Professor, Department of Computer, Mumbai University, Terna Engineering College, INDIA

ABSTRACT

As innovation quickly increments, different detecting and versatility capacities have turned out to be promptly accessible to gadgets and thus portable specially appointed systems (MANETs) are being conveyed to play out various imperative errands. In MANET, control mindful is imperative test issue to enhance the correspondence vitality effectiveness at individual hubs. The proposed effective Power Aware Routing (EPAR) is a power mindful steering convention that builds the system lifetime of MANET. As opposed to ordinary power mindful calculations, EPAR recognizes the limit of a hub by its remaining battery control, as well as by the normal vitality spent in dependably sending information parcels over a particular connection. Utilizing a smaller than normal max detailing, EPAR chooses the way that has the biggest bundle limit at the littlest leftover parcel transmission limit. This convention must have the capacity to handle high portability of the hubs which regularly cause changes in the system topology.

Keywords— MANETs, EPAR, DSR, MTPR, residual battery power

I. INTRODUCTION

A network defined as two or more computers (laptops or mobile) are connected to each other for sharing resources (ex-DVD's, printers etc), exchanging files, or allow electronic communications. In network computers are connected to each other by cables, telephone lines, radio waves, satellites, or infrared light beams. Network can be classified into wide variety of characteristics such as medium used to transport the data, communication protocol used, scale, and topology and organization scope. Depending upon the geographical area covered by a network, it is classified as: Local Area Network (LAN), Metropolitan Area Network (MAN), Wide Area Network (WAN) and Personal Area Network (PAN).Depending on connection method computer network classified into wired network and another is wireless network. There are basic network topologies i.e. Star networks, Bus networks and Ring networks and mesh network. There are also three basic types for wireless network. These are Infrastructure-based networks, Wireless LANs networks and Ad-hoc networks. A versatile specially appointed system is portable, multi-jump remote system which is fit for self-governing operation. Data trade in a system of portable and remote hubs with no infrastructural bolster such system is called as mobile ad-hoc network.

Remote system (wireless) has turned out to be progressively mainstream amid the previous decades. There are two varieties of remote systems or wireless networks i.e. infrastructure and infrastructure less systems. In the previous, interchanges among terminals are set up and kept up through centric controllers. Cases incorporate the cell systems and wireless Local Networks. The last variety is generally alluded to as wireless ad-hoc system. Such a system is composed in an ad-hoc way, where terminals are equipped for building up association's independent from anyone else and speak with each other in a multi-bounce way without the assistance of settled frameworks. This foundation less (infrastructure) property makes an ad-hoc system be immediately sent in a given range and gives vigorous operation. Applications incorporate crisis administrations calamity recuperation, remote sensor systems and home systems administration Communication has turned out to be vital for trading data between individuals anyplace whenever. A portable ad-hoc system (MANET) is a consistently self-designing, framework less system of cell phones associated without wires. Specially appointed is a Latin word. It signifies "for this reason". Every gadget in a MANET is allowed to move autonomously in any course, and will in this manner change its connections to different gadgets as often as possible. The essential test in building a MANET is preparing every gadget to consistently keep up the data required to legitimately course activity. Such systems may

work without anyone else or might be associated with the bigger Internet. They may contain one or numerous and diverse handsets between hubs. This results in a highly dynamic, autonomous topology.

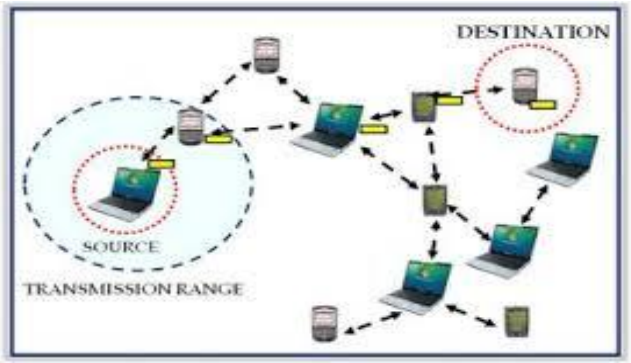

Figure 1: Mobile Ad-hoc Network

MANET is gathering of versatile hubs that frame a system freely of any brought together organization. Since those cell phones are battery worked and broadening the battery lifetime has turned into an imperative point. The vast majority of the scientists have as of late considered power-mindful advancement of proficient conventions for MANETs. Control weariness causes just few of the portable hubs to be separated in administration in whole MANET, while building up correspondence among various versatile hubs.

In this way, Mobile hubs in MANETs are battery driven. In this manner, they experience the ill effects of restricted vitality level issues. Additionally the hubs in the system are moving if a hub moves out of the radio scope of the other hub, the connection between them is broken. Along these lines, in such a situation there are two noteworthy reasons of a connection breakage:

- Node kicking the bucket of vitality weariness
- Node moving out of the radio scope of its neighboring hub.

A. Applications of MANETs:

1. Military Scenarios: MANET supports tactical network for military communications and automated battle fields.

2. Rescue Operations: It provides Disaster recovery, means replacement of fixed infrastructure network in case of environmental disaster.

3. Data Networks: MANET provides support to the network for the exchange of data between mobile devices.

4. Device Networks: Device Networks supports the wireless connections between various mobile devices so that they can communicate.

5. Free Internet Connection Sharing: It also allows us to share the internet with other mobile devices.

II. PRIOR APPROACH

RELATED RESEARCH WORK

A. Routing Protocols:

In wireless ad-hoc network, existing work on routing mainly depends upon getting solution of finding and maintaining correct routes from source to the destination during mobility and changing topology. A proposed algorithm EPAR (Efficient Power Aware Routing), it's a simple algorithm which offers, strong connectivity and assumes limited node range. In EPAR, a shortest path algorithm is implemented as robust connection backbone of the network. There are mainly four types of routing protocol as follows:

1. Proactive Energy-Aware Routing:

With table-driven steering conventions, every hub endeavors to keep up steady up and coming directing data to each other hub in the system. Every hub upgrades its steering table and engenders the overhauls to its neighboring hubs. Subsequently, it is proactive as in when a bundle should be sent the course is as of now known and can be quickly utilized. Just like the case for wired systems, the steering table is developed utilizing either link-state or distance vector algorithm containing a rundown of the considerable number of goals, the following bounce, and the quantity of jumps to every goal. Examples of proactive protocols are Destination Sequenced Distance Vector (DSDV) protocol, Optimum Link State Routing (OLSR) protocol etc.

Advantages: - lower route setup latency.

Disadvantages: - High routing overhead (periodic distribution of routing information)

- Stale routing information in highly dynamic topologies.

2. Reactive Energy-Aware Routing:

With on-request driven steering, routes are found just when a source hub need them. route disclosure and route upkeep are two principle strategies: The route revelation prepare includes sending route ask for bundles from a source to its neighbor hubs, then route disclosure handle forward the demand to their neighbors, etc. Once the route ask for achieves the goal hub, it reacts by uni-casting a course answer packet back to the source hub by means of the neighbor from which it initially got the route ask. At the point when the route ask for achieves a middle of the road hub that has an adequately progressive course, it quits sending and sends a route answer message back to the source. Once the route is set up, some type of route upkeep prepare keeps up it in every hub's interior information structure called a route cache until the goal gets to be distinctly out of reach along the route. Take note of that every hub takes in the steering ways over the long haul not just as a source or a halfway hub additionally as a overhearing neighbor hub. Rather than table-driven steering conventions, not all up-to-date routes are kept up at each hub. Dynamic Source Routing (DSR) and Ad-Hoc On-Demand Distance Vector (AODV) are examples of on-demand driven protocols.

Advantages: - Lower routing overhead

- Reduce power consumption

Disadvantages: - Larger route set up latency
- Data packets may have larger delay
- Route discovery packet flooding

3. Hybrid routing protocol:

This kind of convention joins the upsides of proactive and reactive routing. The routing is at first settled with some proactively prospected routes and afterward serves the request from furthermore enacted hubs through reactive flooding. The decision of either technique requires destiny for run of the mill cases.

Examples of hybrid algorithms are:

ZRP (Zone Routing Protocol) ZRP uses IARP as pro-active and IERP as reactive component.

Advantages: - Reduces impact of disadvantages of proactive and reactive routing protocols.

-No route setup latency for short distance connections

-Lower routing overhead due to reactive routing for further away destinations.

Disadvantages: - more complex

4. Hierarchical routing protocol:

With this kind of convention the decision of proactive and of reactive routing relies on upon the hierarchic level in which a hub dwells. The routing is at first settled with some proactively prospected routes and afterward serves the request from moreover actuated hubs through reactive flooding on the lower levels. Examples of hierarchical routing algorithms are: CBRP (Cluster Based Routing Protocol) and FSR (Fisheye State Routing protocol).

Advantage: - depends on depth of nesting and addressing scheme.

Disadvantage: -Reaction to traffic demand depends on meshing parameters.

III. METHODOLOGY

A.ENERGY EFFICIENT ROUTING ALGORITHMS FOR MANET

Work concentrates on enlarging the current on-request routing protocol and making them energy monitoring. On-request protocol are more reasonable for this review as they regularly have bring down routing overhead than proactive, appropriated most limited way conventions and in this way have low pattern energy utilization. We have utilized DSR as the base on-request routing protocol.

1. DSR Protocol:

Route answer packets through all routes from where the route asks for bundles came. This expands the accessible different ways for source yet in the meantime builds the directing bundle heap of the system. Current detail of DSR does not contain any instrument for routes section refutation or course prioritization when confronted with a decision of various routes. This prompts to stale reserve passages especially in high portability. The information bundle header in DSR comprises of all the moderate route address alongside source and goal, in this way diminishing the throughput [1].

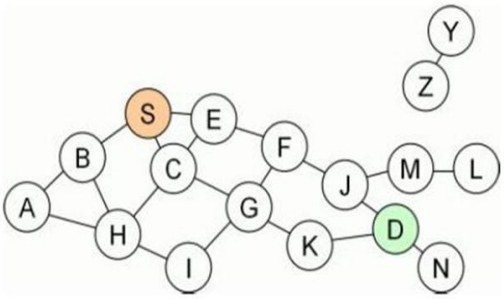

Fig. 2 Route discovery process in DSR from S to D

On the off chance that sender hub knows the entire route to the goal then these routes are put away in the route cache for support. At the point when hub Source(S) needs to send a data to hub Destination (D), on the off chance that it doesn't know a route to Destination (D) then hub Source (S) starts a route revelation handle. Route disclosure is fundamentally in view of flooding system in which route ask for (RREQ) parcels are sent to every one of its neighbors. Every intermediate node of the road hub rebroadcasts it unless it is the goal or it has a route to the goal. This kind of hub answers to the demand with a route answer parcel that is directed back to the source hub. In the event that the hub has officially treated this route ask for it rejects the new got ask. Route upkeep will go on if a connection of route is broken then it erases every route having this connection from its reserve, then it creates a route mistake bundle to advise the Source hub and every single intermediate node of the road hub about this connection disappointment until this route blunder parcel spans to the goal. After that another route asks for propelled by source to locate another route or check in its routes store. Because of reserving DSR is more viable at low portability and at low loads. In any case, it has numerous constraints, for example, it doesn't take into thought the limit of every hub as power computing and no security component is characterized for DSR [16].

2. Minimum Transmission Power Routing:

The larger part of energy efficient routing protocols for MANET attempt to diminish energy utilization by method for a energy efficient routing metric, utilized as a part of directing table calculation rather than the minimum-hop metric. A first approach for energy efficient is known as Minimum Transmission Power Routing (MTPR). That instrument utilizes a basic energy metric, spoke to by the aggregate vitality expended to forward the data along the route. Thusly, MTPR diminishes the general transmission control devoured per bundle. The transmission control required is relative to dα where is the separation between two hubs and 2<=α<=4. MTPR has a tendency to choose routes with a greater

ISSN (ONLINE): 2250-0758, ISSN (PRINT): 2394-6962

number of jumps than the min-bounce way, which includes more hubs and expands end-to-end delays. In addition, since MTPR does not consider the rest of the force of hubs, it may not prevail with regards to augmenting the lifetime of every hub [10].

If we consider a generic route rd= no,n1…..nd where no is the source node and nd is the destination node and a function T(ni,nj) denoting the energy consumed in transmitting over the hop (ni,nj), the total transmission power for the route is calculated as:

$$P(rd) = \sum_{i=0}^{d-1} T(ni, ni+1)$$

The optimal route r_0 satisfies the following condition:

Pr_o= min P (r_j) optimal sol
r_j€r*

Where r* is set of all possible routes.

3. Efficient Power Aware Routing (EPAR):

The efficient Power Aware Routing (EPAR) is a new power aware routing protocol that increases the network lifetime of MANET.EPAR identifies the capacity of a node not just by its residual battery power, but also by the energy spent in reliably forwarding data packets over a specific link. EPAR decreases mean delay especially for high load network [1].

4. Data packet format in EPAR

The Pt value must be the power that the packet is actually transmitted on the link. If for any reason a node chooses to change the transmit power for hop i, then it must set the Pt value in minimum transmission power (MTP[i]) to the actual transmit power. If the new power differs by more than M thresh then the Link Flag is set.

IP Header	DSR Fixed Header	DSR Source Header	DSR source Route Address [1….N]	EPAR Source Route MTP [1…..N]	Link Flag	DATA

Table 1: data packet format in modified EPAR

Table shows the data packet format for EPAR. The packet includes the DSR fields besides the special fields of EPAR

B. Algorithm

1. Route discovery and Maintenance in EPAR

This approach is a dynamic distributed load balancing approach that evades energy congested hubs and picks ways that are daintily stacked. This helps EPAR to accomplish least fluctuation in power levels of various hubs in the system and augments the system lifetime.

There are two steering goals for minimum total transmission energy and total operational lifetime of the system can be commonly opposing. For instance, when a few least energy routes a typical hub, the battery force of this hub will rapidly keep running into exhaustion, shortening the system lifetime. While picking a way, the DSR execution picks the way with least no. of hop.

For EPAR, be that as it may, the way is picked in view of energy. To begin with, we compute the battery control for every path, that is, the most minimal hop energy of the way. The way is then chosen by picking the way with the most extreme least bounce power. For instance, consider the accompanying situation. There are two ways to browse. The principal way contains three hops with vitality values 22, 18, and 100, and the second way contains four hops with vitality values 40, 25, 45, and 90. The battery control for the principal way is 18, while the battery control for the second way is 25. Since 25 are more prominent than 8, the second way would be picked. EPAR calculation is an on request source steering convention that utilizations battery lifetime forecast.

C. Working Principal (Route Discovery):

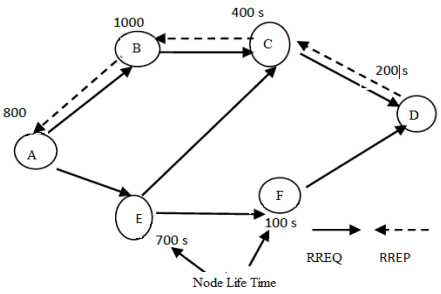

Fig 3: Route discovery and maintenance process in EPAR

EPAR utilizes battery lifetime forecast. In fig 3, DSR chooses the most brief way AEFD or AECD and MTPR chooses least power route way AEFD. Be that as it may, proposed EPAR chooses ABCD just, in light of the fact that that chose way has the most extreme lifetime of the system (1000s). It expands the system lifetime of the MANET appeared in condition (equation) .The goal of this directing convention is to develop the administration lifetime of MANET with element topology. This protocol would choose the way whose lifetime is most extreme. We speak to our target work (objective function) as take after:

Max Tk t =Min Ti t
i€k

where Tk(t) =life time of path k and Ti(t)=predicted life time node i in path k.

Proof: *1.*

1. Tk 0=Min Ti 0= Min (T A0, T B0, T C0, T D0)
Tk (0) =Min (Ti (0)) = Min (800, 1000, 400,200) = 200
2. Tk 0=Min Ti 0= Min (T A0, T E0, T C0, T D0)
Tπ (0)) =Min (Ti (0)) = Min (800,700,400,200) = 200
3. Tk 0=Min Ti 0= Min (T A0, T E0, T F0, T D0)
Tπ (0)) =Min (Ti (0)) = Min (800,700,100,200) = 100
Hence Max Tk 0=200,200,100=200

ISSN (ONLINE): 2250-0758, ISSN (PRINT): 2394-6962

Our approach is a dynamic distributed load balancing approach that avoids power-congested nodes and chooses paths that are lightly loaded. This helps EPAR achieve minimum variance in energy levels of different nodes in the network and maximizes the network lifetime [1].

D. Analysis and Design:

Minimize measure of energy consumed by all parcels navigating from source to goal hub. So we need to compute aggregate sum of energy expended when it goes from every single hub on the route to the following hope. Taking after condition (equation) is for energy expended for on parcel.

$$Ec = \sum_{i=1}^{k} T\, n_i, n_{i+1}$$

Where, ni to nk is hubs in the route while T means the energy expended in transmitting and getting a parcel more than one hop. At that point we locate the base Ec for all bundles. The fundamental target of EPAR is to minimize the change in the rest of the energies of the considerable number of hubs and along these lines drag out the system lifetime.

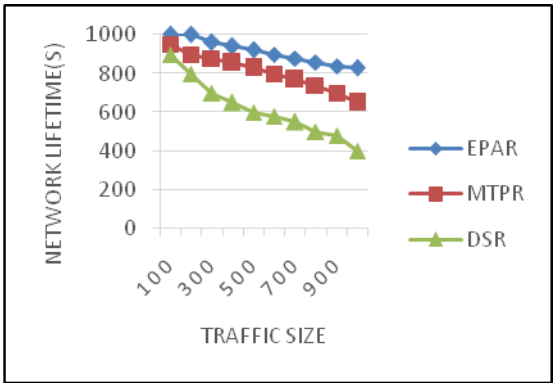

Fig.4. N/W Lifetime varying with respect network size (traffic load)

E. Network metrics

1. Remaining Battery Power

Be that as it may, remaining battery life τi= Pi/ri relies on upon an obscure portable hubs i, r and therefore, is considered as an arbitrary variable. Give Ti be an estimate of the rest of the battery life τi= Pi/ri, and ui= u (Ti) be the utility of the battery control at hub i . The quantity of hubs in the system versus the normal average battery power is considered as the metric to dissect the execution of the conventions as far as power.

2. Power Consumption

The mobile node battery power consumption is chiefly because of transmission and gathering of information packet. At whatever point a hub stays active, it discharge power. Indeed specific, the execution of EPAR, MTPR and DSR in little size systems was tantamount. In any case, in medium and extensive size systems, the EPAR and MTPR delivered great outcomes. The near review demonstrates that EPAR calculation is one of the best vitality productive calculations. At the point when inactive node taking a part in system, however is in the idle of gear mode sitting tight for the bundles, the battery continues releasing. The battery power consumption refers to the power spent in counts that occur in the hubs for directing and different choices. The quantity of hubs in the system versus normal average battery power is considered as a metric.

3. Dropped Packets

The fraction of dropped bundles increments as well as the movement force increments. In this way, execution at a hub is regularly measured regarding delay, as well as far as the likelihood of dropped bundles. Dropped parcel might be re-transmitted on a conclusion to-end premise with a specific end goal to guarantee that all information are in the long run exchanged from source to goal. Misfortunes somewhere around 5% and 10% of the aggregate bundle stream will influence the system execution fundamentally.

4. Network lifetime

It is the time traverse from the sending to the moment when the system is viewed as nonfunctional. At the point when a system ought to be viewed as nonfunctional is, nonetheless, application-particular. It can be, for instance, the moment when the first mobile node dies, a percentage of mobile nodes die, the network partitions or the loss of scope happens, It consequences for the entire system execution. In the event that the battery power is high in all the versatile hubs in the MANET, arrange lifetime is expanded

IV. OUR APPROACH

A. Comparative Study of Algorithm

Algorithm	Metrics	Result	Analysis
Minimum Total Transmission power routing (MTPR) [1]	-Energy - Transmission Time	-A routing protocol can easily introduce energy efficiency in its packet forwarding. -minimize total transmission power consumption of nodes	-Can bring a new hidden terminal problem. makes more collision, and it results in more energy consumption
2.MBCR (Minimum Battery Cost Routing) [3]	use battery power evenly by using a cost function	extend the network lifetime of nodes	Because it considers Only the total cost, remaining energy level of an individual node may

			hardly be accounted for.
.Min-Max Battery Cost Routing (MMBCR) [3]	cost function and high residual battery capacity as metrics	Does not considers the weakest node over a path and thereby provides a balanced energy	no guarantee that minimum total transmission power paths will be selected, it can consume more power to transmit user traffic from a source to a destination, reduces the lifetime of all nodes.

4.CMMBCR(Conditional Max Min Battery Capacity Routing) [2]	- Remaining power -Total energy consumption of node	Minimizes total transmission power of nodes and also consider remaining power of node	-it does not guarantee that the nodes with high remaining power will survive without power breakage even when heavy traffic is passing through the node.
5.Minimum Drain Rate (MDR) [17]	- remaining battery capacity -drain rate(Energy dissipation at a given node)	-MDR extends nodal battery life and the duration of paths(connection life time)	- described a mechanism, called the Minimum Drain Rate (MDR) that can be used in any of the existing MANET routing protocols as a route establishme nt criterion - offers superior Performance .
6.DSR Protocol[1]	-Packet delivery fraction -Average Through put -Packet Loss	Increases the available multiple paths for source but at the same time increases the routing packet load of the network	-limits its performance in certain scenarios -DSR does not support multicasting.
Efficient Power Aware Routing (EPAR) [1]	- remaining battery power -power consumption -dropped packets -network lifetime	Increases the network lifetime of MANET	This protocol must be able to handle high mobility of the nodes which often cause changes in the network topology.

V. CONCLUSION

This exploration paper for the most part manages the issue of boosting the system lifetime of a MANET, i.e. the day and age amid which the system is completely working. We exhibited a unique arrangement called EPAR which is essentially a change on DSR. This review has assessed three power-mindful specially appointed steering conventions in various system environments thinking about system lifetime and bundle conveyance proportion. Generally speaking, the discoveries demonstrate that the energy utilization and throughput in little size systems did not uncover any huge contrasts. Nonetheless, for medium and extensive ad-hoc systems the DSR execution turned out to be wasteful in this review. Specifically, the execution of EPAR, MTPR and DSR in little size systems was equivalent. Be that as it may, in medium and huge size systems, the EPAR and MTPR delivered great outcomes. The relative review demonstrates that EPAR calculation is one of the best energy productive calculations.

REFERENCES

[1] Designing Energy Routing Protocol with Power Consumption Optimization in MANETShivashankar1,

Suresh H2.Varaprasad Golla3, 1Dr. Ambedkar Institute of Technology, Bangalore 560 056.2Bagnalore Institute of Technology, Bangalore.3B.M.S.College of Engineering, Bangalore .
[2] C.-K. Toh, "Maximum Battery Life Routing to Support Ubiquitous Mobile Computing in Wireless Ad Hoc Networks," IEEE Communications
Magazine, June 2001.
[3] Maximum Battery Life Routing to Support Ubiquitous Mobile Computing in Wireless Ad Hoc NetworksC.-K. Toh, Georgia Institute of Technology.
[4] A Mobility-Prediction-Based Relay Deployment Framework for Conserving Power in MANETs Aravindhan Venkatesh Thomas F. La Porta, Fellow, IEEE, and Raj Acharya, Senior Member, IEEE.
[5] On Quality Of Service Routing in Ad-Hoc Networks Jaydeep Punde, Niki Pissinou, Kia Makki Telecommunication and Information Technology Institute Florida International University, Miami, FL-33174,USA.
[6] Performance Analysis of Mobility Based Routing Protocols in MANET Joy Ghosh, 2.Sumesh J. Philip, 3.Chunming Qiao Department of Computer Science and Engineering, University at Buffalo, The State University of New York,201 Bell Hall, Buffalo, NY 14260-2000
[7] Routing Mechanisms for Mobile Ad Hoc Networks Based on the Energy Drain Rate Dongkyun Kim, J.J. Garcia-Luna-Aceves, Senior Member, IEEE, Katia Obraczka, Member, IEEE, Juan-Carlos Cano, and Pietro Manzoni, Member, IEEE.
[8] Minimum-Energy Broadcast Routing in Static Ad Hoc Wireless Networks P.-J. Wan∗ G. C˘alinescuX.-Y. LiO. Frieder.
[9] Performance Analysis of MANET Routing Protocols in the Presence of Self-Similar Traffic
A-Mashri, Mohamed O-Khaoua Dept. of Electrical & Computer Engineering,. IEEE 2006
[10] Routing Mechanisms for Mobile Ad Hoc Networks Based on the Energy Drain Rate
Dongkyun Kim, J.J. Garcia-Luna-Aceves, Senior Member, IEEE, Katia Obraczka, Member, IEEE, Juan-Carlos Cano, and Pietro Manzoni, Member, IEEE.
[11] Power control algorithms for mobile ad hoc networks Nuraj L. Pradhan *, Tarek Saadawi ,Electrical Engineering Department, The City College of the City University of New York, 160 Convent Avenue, New York, 1 June 2011
[12] Power-Aware Routing Based on The Energy Drain Rate for Mobile Ad Hoc Networks ,Dongkyun Kim, J.J Garcia-Luna-Aceves and Katia Obraczka University of California at Santa CruzSanta Cruz, ,Polytechnic University of Valencia ,Camino de Vera, s/n, SPAIN
[13] Dilip Kumar S. M. and Vijaya Kumar B. P. "Energy-Aware Multicast Routing in MANETs: A Genetic Algorithm Approach", International Journal, of Computer Science and Information Security (IJCSIS), vol. 2, June, 2009
[14] S. Singh, M. Woo and C.S. Raghavendra, "Power-Aware Routing in Mobile Ad Hoc Networks", MobiCom '98 Proceedings of the 4th annual ,ACM/IEEE International , Conference on Mobile Computing and Networking,1998
[15] A Survey of Energy Efficient Routing Protocols for Mobile Ad-hoc Networks Ajit Singh1, Harshit Tiwari2, Alok Vajpayee3, Shiva Prakash4 Department of Computer Science and Engineering, Madan Mohan Malviya Engineering College, Gorakhpur, India
[16] The Dynamic Source Routing Protocol (DSR)for Mobile Ad Hoc Networks for IPv4