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Efficiency Comparison of Routing Protocols for Locating Nearby Nodes in MANET

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Abstract- MANET network is a collection of mobile nodes that are dynamically and arbitrarily situated in such a way that the communication between the nodes changing consistently, for establishment of communication within the network, network finds the routes between the nodes. The essential objective of such an Ad-hoc network is finds right and efficient route between the nodes for messaging. Energy parameter is an important issue in MANET for efficient or better communication. Nodes are working in presence of limited energy within the network. So for preventing energy consumption, MANET needs to efficient routing scheme. In wireless network comparison to wired network, proper utilization of battery power is essential to maintain network connectivity. Different energy efficient routing protocols like AODV, DSR and ZRP which are finds nearby nodes in network and consumes energy in different amount. These three protocols falls in different category and follow own rules. This Paper presents comparative study of AODV, DSR and ZRP routing protocols on different parameters like PDR, Routing Overhead and Throughput. Network Simulator NS-2 used for the comparative study of AODV, DSR and ZRP and finds DSR is energy efficient protocol in Mobile Ad-hoc Network.

Keywords: MANET, AODV, DSR, DSR, ZRP, Energy efficient, NS-2

I. INTRODUCTION

A Mobile Ad-hoc Network (MANET) [1] is collection of mobile nodes which are changing their routes dynamically. On the basis of routing scheme, MANET routing fall in two categories [1] first is Proactive Routing Protocol and another is Reactive Routing Protocol. Other types of routing protocol which combines the feature of both Proactive and Reactive protocol called Hybrid routing Protocol. AODV (Ad-hoc On Demand Distance Vector) and DSR (Dynamic Source Routing) protocols are Reactive Protocols [2] which are based on demand or on request so this protocol also called On-Demand routing protocol. ZRP (Zone Routing Protocol) is Hybrid routing protocol [2] which is used for large network or for large geographic area. Due to dynamically changing routes nature, MANET used in critical areas like in military, in disaster areas, in rescue etc.

MANET has [1] faced many challenges for communicating with nodes. MANET has [1] many issues like Power issue, Bandwidth issue, Security issue [3] etc. but main or important issue is Power Constraint. The challenge in ad hoc networks is that regardless of the possibility that a host does not convey all alone, it still much of the time advances information and directing packets for others, which depletes its battery. Turning off a non communicating node to moderate battery power may not be dependably a smart thought, as it might segment the system. Ordinary on-request routing protocol, such as AODV, DSR and ZRP are energy ignorant. Routing is done on the basis of shortest way [4], the cost metric either considers number of jumps or end-to-end defer when route is built up. The protocols don't proactively adjust routes until they break. In the event that nodes are energy compelled, such measurements may have unfriendly impact on the system lifetime all in all. For instance, a node that lies on a few routes will kick the bucket rashly and the System may get divided. Since recharging and replacing the battery is not practical in the MANET applications. It is basic to study and configuration routing protocol which can able to conserve node energy to prevent such premature death.

This work concentrates on expanding the current Reactive routing protocols like AODV, DSR and Hybrid routing protocol like ZRP making them energy monitoring. Reactive DSR protocols are more reasonable for this review as they regularly have bring down routing overhead than proactive, distributed shortest route protocol and along these lines have a low pattern energy utilization. AODV is utilized as the base on-request routing protocol. The strategies implemented are non specific in nature and should be applicable to other on-request routing protocol, such as DSR.

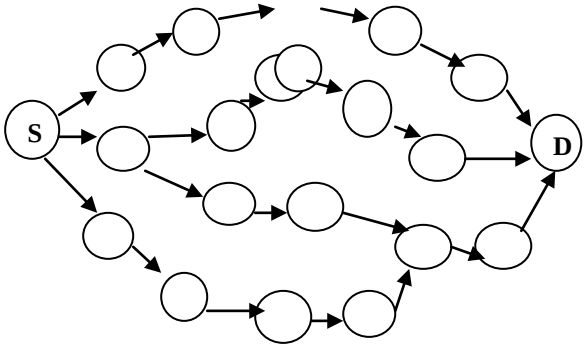

Fig1: Multipath Routing in MANET

II. ROUTING IN MANET

A Routing [5] protocol keeps up the network topology for a Wireless Ad hoc Network. If by chance that a connection breaks,

routing protocols has the obligation to repair that connection keeping in mind the end goal to keep up the consistency of the network. Diverse routing protocols have different techniques to repair a broken connection. The repair methodology is very particular to each key routing protocol; in this manner it is very difficult to break down the advantages and disadvantages of every protocol. The possible path is to discover the connection break probabilities of various classes of routing protocol since the issue incredibly impact the productivity of a routing protocol. The connection break issue will be investigate [5], the impact of the issue on every classifications of routing protocol, and brought about routing table refresh to them. The classifications of most well known routing protocol, table-driven, on-request and hybrid routing protocol, are talked about in this article.

A. PROACTIVE ROUTING PROTOCOL (TABLE DRIVEN)

Pro-active routing protocols [6] are the same as present Internet routing protocol, for example, the Routing Information Protocol, Distance-Vector, Open Shortest Path First and Link state routing protocol. They endeavor to keep up steady [3], progressive routing data of the entire network. Every node needs to keep up at least one table [7] to store routing data, and reaction to changes in network topology by broadcasting and propagating. Some of the existing [4] pro-active ad hoc routing protocols are: Destination Sequenced Distance Vector (DSDV) [1] routing, Wireless Routing Protocol (WRP) [1] routing protocol.

B. REACTIVE ROUTING PROTOCOL (ON DEMAND)

These protocols attempt to dispense with the traditional routing tables and therefore lessen the requirement for refreshing these tables to track changes in the network topology. At the point when a source requires to a goal, it needs to set up a route by route discovery technique, keep up it by some type of route support methodology until either the route is did not seek anymore or it ends up noticeably difficult to reach, lastly tear down it by route deletion strategy. In pro-active routing protocols, routes are constantly accessible [8], with the utilization of signaling traffic and power. Some of Reactive routing protocol are Ad hoc On-Demand Distance Vector (AODV) [1] routing and Dynamic Source Routing (DSR) [1] routing protocol.

C. HYBRID ROUTING PROTOCOL

Hybrid protocols have the combination of some features of Reactive protocol and some feature of Proactive protocols**.** These protocols have the upside of both Proactive and Reactive routing protocol to adjust the delay which was the drawback of Table driven protocol and control overhead. Primary component of Hybrid Routing protocol is that the routing is Proactive for short distances and Reactive for long distances. The common drawback of Hybrid routing protocols is that the nodes need to keep up high level state topological data which prompts more memory and power utilization. Mainly Hybrid routing protocol is ZRP (Zone Routing Protocol).

III. PERFORMANCE OF ENERGY

EFFICIENT PROTOCOL

Total throughput and routing burden are key measures of significance when assessing protocol performance. Throughput is straightforwardly identified with the packet drops. Packet drops ordinarily happen due to network blockage (e.g., buffer floods) or for absence of a route. Since most dynamic protocols (Proactive or Reactive protocols) attempt to keep the last sort (no route) of drops low by being receptive to topology changes, network congestion drops turn into the predominant component when judging relative throughput execution [8]. For similar data activity stack, routing protocol efficiency (regarding control overhead in bytes or packets) decides the relative level of network blockage in light of the fact that both routing control packets and data packets have a similar channel data transfer capacity and buffers .The execution of three conventions like AODV, DSR what's more, ZRP is simulated in proposed plot on the premise of:-

A. DIFFERENT PAUSE TIME- In pause time the simulation of AODV, DSR and ZRP protocols are done if there should arise an occurrence of various time intervals like 20, 40, 60, up to 100.

B. DIFFERENT NODE MOBILITY- In various mobility case the protocol execution in done in the event of 5 m/s, 10 m/s, 20 m/s, 25 m/s and most extreme speed of 30m/s.

C. RANDOM MOBILITY- The instance of random mobility is each node in network moves in surrounding region in various mobility speeds and the most extreme mobility speed is 30 m/s.

D. DIFFERENT NODE DENSITY- The node density is increment in network to watch the execution of routing protocols if there should be an occurrence of more senders and receivers and furthermore examinations the impact of dense network on energy utilization.

The entire execution of network is measurers through Performance Metrics like throughput, routing load, energy utilization per packet and energy deplete rate & maximize the lifetime [9] of network nodes and henceforth the network operation all in all. The primary objectives of the calculation are reasonable energy preservation via: Rotating rest periods similarly among network nodes consequently giving nodes equal opportunity for reducing energy utilization. Assisting routing algorithms in making choices in view of energy reasonableness little effect on network operation, for instance, presents slight or no extra movement or energy cost.

Routing Load in network relies on upon route discovery latency, extra delays at each hop (including queuing, channel access and transmission delays), and the number of hops. At low loads, queuing and channel access delays don't contribute much to the general delay. In this establishment, Proactive protocols, by excellence of discovering ideal routes between all nodes sets are probably going to have better delay execution. Be that as it may, at direct to high loads, queuing and channel access delays became significant enough to exceed route discovery latency.

So, like in the case of throughput, routing protocol overhead again becomes key factor in determining relative delay execution.

IV PERFORMANCE MATRICS

NS or the Network Simulator (likewise prominently called NS-2 [6], in reference to its present era) is a discrete event Network Simulator. NS is utilized as a part of the reproduction [10] of routing protocol, among others, and is mainly utilized as a part of

Research in ad-hoc Network. Many changes and revisions are performed in the NS. Among these are the University of California and Cornell University who built up the REAL Network Simulator, the establishment which NS depends on. Since 1995 the Defense Advanced Research Projects Agency (DARPA) [10] bolstered improvement of NS through the Virtual Inter Network Testbed (VINT) project. Currently the National Science Foundation [11] (NSF) has joined the ride being developed and continuous Researcher contributes his effort for development of Network Simulator.

In NS the traffic sources are Constant Bit Rate (CBR). The source-destination sets are spread arbitrarily over the network. The mobility model uses "random waypoint model" in a rectangular field of 1000m x1000m with 20, 40, 50 and 60 nodes. In Fig-2 (Table-1), compressed the model parameters that have been utilized for these investigations .In this examination, taking after four execution measurements to think about the three, Routing protocol. At that point get Simulator Parameter like Number of nodes, Dimension, Routing protocol, activity and so forth. As indicated by below [1] table-1 Network is simulated. The recreation results are assessed if there should arise an occurrence of delay time. The versatility and delay time investigation is done if there should arise an occurrence of 50 nodes not in the event of 20, 40, and 60 nodes [1] but the nodes variation is considered in case of random mobility and 100 simulation time.

Table-1: Fif-2 Simulation Parameter for Analysis

Number of Nodes	20,40,50,60
Dimension of simulated area	800*600
Pause time	20,30,40,60,80,100
Routing Protocol	AODV,DSR,ZRP
ZRP radius	200 meters
Radio range	550 meters
Pause time(seconds)	20,40,60,80,100
Transport Layer	TCP,UDP
Traffic type	CBR,FTP
Packet size(bytes)	512 bytes
Nodes mobility(m/s)	5,10,15,20,25,30
Random mobility scenario	Consider with max mobility Of 30 m/s
Transmit Energy	1.5
Receiving Energy	1.0
Idle Energy	0.017
Sense Energy	0.470
Sleep Energy	0.07

A. PERFORMANCE MATRICES

The performances of routing protocols are measured on the basis of following performance metrics**.**

a. Average to end to end delay- It is characterized as the normal time taken by the data packets to spread from source to destination over a MANET. This incorporates all possible delays [11] created by buffering amid routing discovery latency, queuing at the interface queue, and retransmission delays at the MAC, spread and exchange times..

b. Normalized Routing Load (NRL) - The number of routing packets [12] transmitted per data packet delivered at the destination in MANET.

c. Packet Delivery Fraction (PDF) - This is the ratio of the [12] quantity of data packets effectively conveyed to the destinations to those produced by sources. Packet Delivery Fraction [12] = received packets/sent packets * 100 [12].

d. Throughput- It is the rate of effectively transmitted data packets in a unit time in the network during the reproduction.

e. Energy Cost- The energy cost is ascertained per packet and aggregate energy utilization in network.

V. SIMULATION RESULTS & DISCUSSION

The simulation results are assessed if there should be an occurrence of Energy based AODV, DSR and ZRP protocols. The energy is the life of nodes in network and least energy utilization routing protocol is the best to route in network.

A. Results evaluated in Pause time with Random mobility

a. Throughput Analysis in Pause time- The throughput parameter measures the unit time data in network of data packets. The throughput improvement is demonstrates the better energy use. This Graph appears Through Put Vs Pause Time. Through Put is in Y pivot where as Pause Time is in X pivot. This Graph Shows that as Pause Time expands the Through Put of DSR was more noteworthy than AODV and ZRP. Though DSR having more noteworthy Throughput among the three. The DSR protocol is more energy efficient then other routing protocol in term of energy utilization. The route cache data is points of interest in route break because of connection close and demand time out in network. The throughput difference in various pause time likewise increments among these energy based protocols.

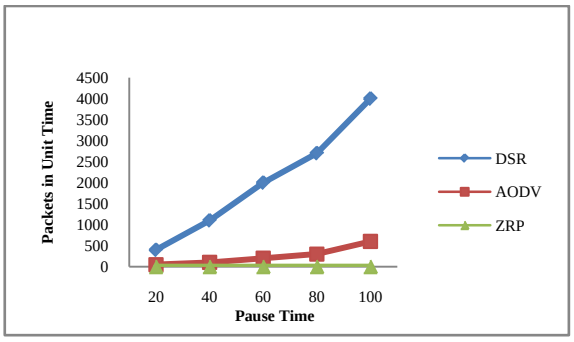

Fig-3 Throughput Analysis

b. Routing Overhead analysis in pause time-The control packets are finding the destination in organizes by that the correspondence in the middle of sender and receiver is started. The route foundation packets are affirming the destination and after that the data deliver is begun. This Graph demonstrates Routing Load Vs Pause Time investigation of AODV, DSR and ZRP protocol. Routing Overhead is in Y pivot where as Pause Time is in X pivot. This Graph Demonstrates that as Pause Time builds the Routing Load of ZRP was more prominent than AODV & DSR. Though DSR having minimum Routing Load among the three [11]. The base routing overhead reason in DSR is to keeping up the solid availability

because of their routing mechanism. The AODV is totally destroyed the routing data by that the again routing is deliver in network for sending same destination in network. In ZRP the zone is made and the correspondence with other zone conceivable to improve routing overhead.

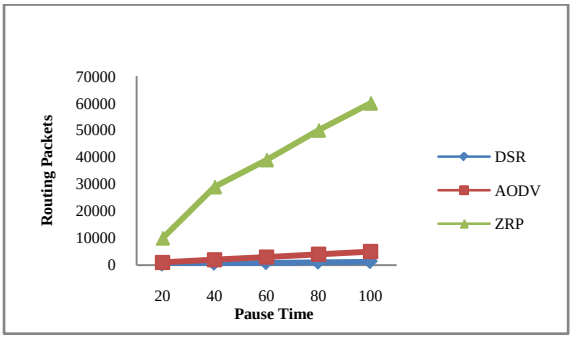

Fig-4 Routing Overhead Analysis

c. Packet Delivery Ratio in Pause Time- The packet rate percentage or Packet Delivery Ratio (PDR) is totally relying upon the proportion of getting and sending. On the off chance that the distinction in the middle of sending and accepting is more than in the PDR value is additionally degrades in network. This Graph indicates Packet Delivery Ratio Vs Pause Time. Packet Delivery Ratio is in Y pivot where as Pause Time is in X pivot. This Graph Shows that as Pause Time builds the Packet Delivery Ratio of DSR was more noteworthy than AODV & ZRP. While DSR having more noteworthy Packet Delivery Ratio among the three. The time around 80 seconds the PDR of AODV and DSR is equivalent however from that point onward, at time 100 DSR protocol again get the lead in execution. Beyond 200 meters range and because of that the energy utilization is likewise more in network [10].

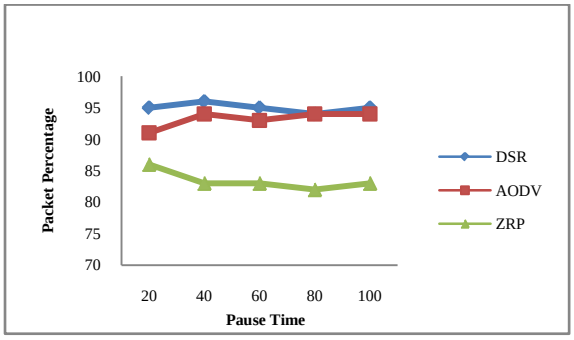

Fig-5 PDR Analysis

B. Results evaluated in different mobility

a. Throughput Analysis in different mobility- This Graph appears Throughput Vs Mobility in simulation time of 100 seconds. Throughput is in Y pivot where as Mobility is in X pivot. This Graph demonstrates that as portability builds the Throughput or packets in unit time of DSR was more prominent than AODV and ZRP. Though DSR has more noteworthy throughput as contrast with AODV and ZRP [12]. The greatest versatility is considered here of 30 m/s of portable nodes. Presently the dynamic topology that progressions as often as possible is the real reason for the energy loss in network yet if there should arise an occurrence of DSR protocol the throughput is better and most elevated at 20m/s and 25m/s in network. The throughput of AODV is additionally enhances as contrast with ZRP however not as much as DSR. The ZRP protocol is appearing as common execution at all portability cases with the goal that it can likewise be anticipated that in higher energy the ZRP is demonstrating same outcome.

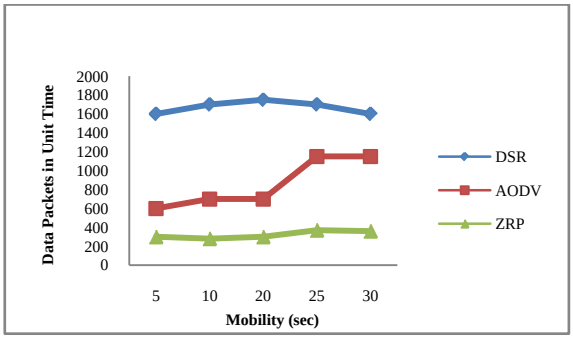

Fig-5 Throughput analysis in different mobility

b. Routing load Analysis in different mobility- The routing packets execution if there should be an occurrence of different mobility is assessed to examine the impact of portability on routing packets delivery in network. The portability of 30 m/s is demonstrating the little upgrade in routing packets in all routing protocols. This Graph demonstrates Routing Load Vs Mobility. Routing overhead is in Y pivot where as Mobility is in X pivot. This Graph demonstrates that as mobility builds the Routing Load of ZRP was more prominent than AODV and DSR. Routing heap of DSR again not as a lot of as contrast with AODV and ZRP. The ZRP routing overhead is incredibly high because of finding the destination in various zones. The DSR lessens the energy utilization on the grounds that the

routing packets are likewise required energy for data sending and receiving. The routing strategy of DSR is additionally energy productive and enhances the network execution to limit routing load.

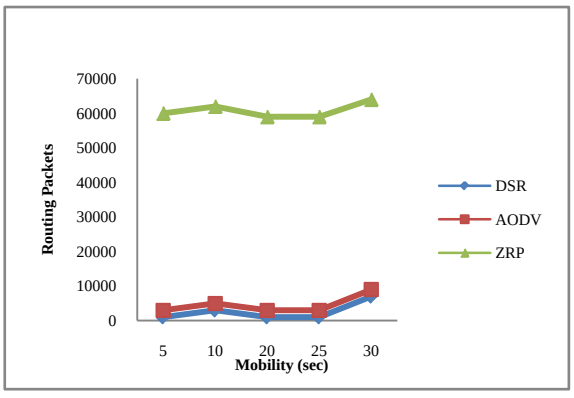

Fig-6 Routing Overhead in different mobility

c. Packet Delivery Ratio in different mobility- The PDR execution in different mobility is assessed to recognize the energy use in rate of data delivery in MANET. This Graph demonstrates Packet Delivery Ratio Vs Mobility. Packet Delivery Ratio is in Y pivot where as Mobility is in X pivot. This Graph demonstrates that as Mobility builds the Packet Delivery Ratio of DSR is more noteworthy than AODV and ZRP. The data accepting of DSR is high as contrast with AODV yet the ratio of sending and receiving in AODV and DSR is practically same because of that the PDR

execution is likewise almost no fluctuate. The ZRP execution is as typically acceptable very little better. The energy efficient routing is just possible through DSR protocol by sending and receiving maximum number of packets in network [12].

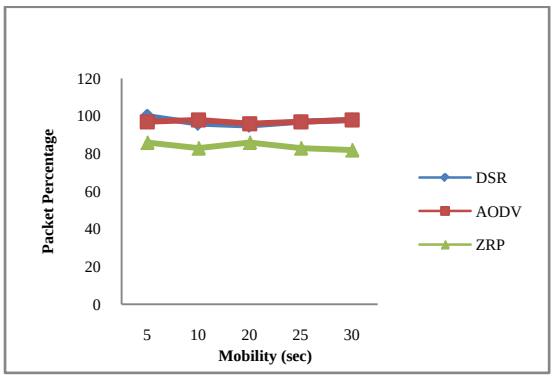

Fig-7 PDR Analysis in different mobility

C. Results evaluated in different node density but in Random mobility

a. Throughput analysis in random mobility- The throughput is again assessed in a similar dynamic network yet here the nodes mobility are random and the node densities are shifting in a simulation time of 100 seconds in MANET. Throughput or packets in unit time is in Y pivot where as Node density is in X pivot. This Graph demonstrates that with respect to expanding the node density builds the throughput in network and after all the throughput execution is more prominent

than AODV and ZRP. While DSR has more noteworthy throughput as contrast with AODV and ZRP it implies that used the energy utilization. The node density 30 throughput execution is highest of DSR however in the event of 40 and 50 execution degrades because of improvement of senders and gets additionally the irregular mobility is utilized by that the eccentric the movement of nodes.

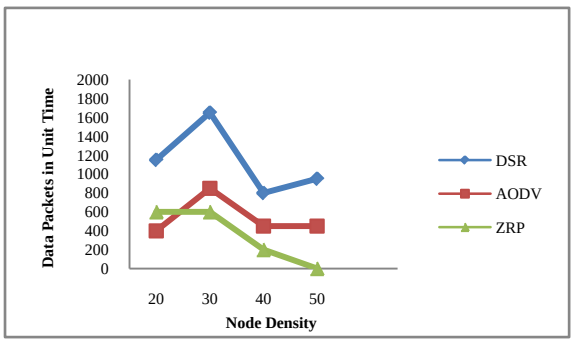

Fig-8 Throughput Analysis in Random mobility

b. Routing Overhead in Random mobility- The routing packets or link establishment packets are overflowed by sender by that the communication between sender and recipient agents is possible. The route establishments packets are affirm the destination and after that the data delivery is begun. This Graph demonstrates Routing Load Vs Node density analysis of AODV, DSR and ZRP protocol in irregular mobility [12]. Routing Overhead is in Y pivot where as Node density is in X pivot.

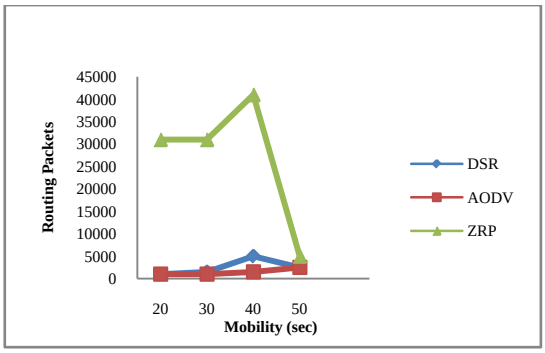

Fig-9 Routing Overhead in Random Analysis

c. Packet Delivery Ratio in Random mobility- The PDR execution around then assessed if there should be an occurrence of various node densities. The energy utilization effectively decreases packet loss by that PDR advanced. Rate of packets (PDR) is in Y pivot where as Node density is in X pivot. This Graph demonstrates that as node density builds the PDR of DSR is additionally more as contrast with rest of the was AODV and ZRP routing protocols. Though DSR has more prominent PDR as contrast with AODV and ZRP [12]. In this situation just the node density is fluctuating however the real condition is of irregular mobility of MANET is utilized as a part of a fixed simulation time of 100 seconds. The DSR execution is likewise keeping up the lead yet if there should be an occurrence of 40 node density the execution rate is degrades however it doesn't imply that the packets receiving is lessens

energy is wasted and furthermore enhances at 50 node density.

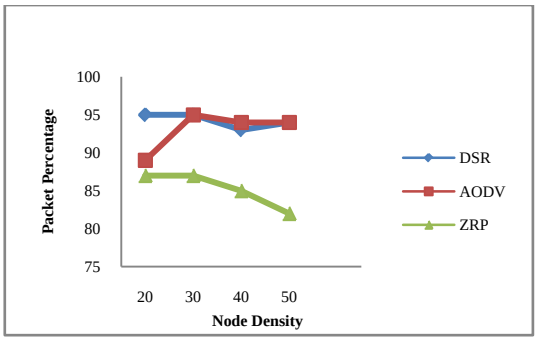

Fig-10 PDR Analysis in Random mobility

VI CONCLUSION

This methodology for the most part enhances the power exhaustion and keeps up pretty much uniform power utilization among every one of the nodes in the network while keeping up viable throughput. In the simulation, it is watch that a sharp execution and power utilization picks up utilizing the considered AODV, DSR and ZRP protocols performances. The energy based routing is finished with AODV, DSR and ZRP execution has been studied by means of simulation. Simulation comes about have shown that the DSR routing protocol gives strength to mobility and improves protocol execution. In any case, this routing performance may perform well under various delay time, energy utilization, Node mobility, irregular portability and different hub density. Its execution has been discovered much superior to anything other existing protocols in dense medium as mobility of discovering dynamic routes increments. The energy utilization per packet in DSR protocol is less. The comparison analysis will do about these

protocols and in the last the conclusion is that the DSR is the more energy effective protocol for routing and for energy based routing, DSR routing protocol is the best one for Mobile ad-hoc Network.

VII. REFERENCES

[1] Ruchi Gupta, Akhilesh A.Waoo and Dr. Sanjay Sharma, "A Survey of Energy Efficient Location Based Multipath Routing In MANET" in IJCA, Dec 2012.

[2] Shwaita Kodesia and Asst. Prof. Prem Narayan Arya, "A Review of Energy Efficient Routing Protocols for Mobile Ad-hoc Network" in JGRCS, May 2012.

[3] Charles Perkins, Elizabeth Royer, and Samir R. Das. Ad hoc on demand distance vector (AODV) routing", IETF Internet Draft , 2003.

[4] Subhankar Mishra1, Sudhansu Mohan Satpathy," energy efficiency in ad hoc networks", International Journal of Ad hoc, Sensor & Ubiquitous Computing" (IJASUC) Vol.2, No.1, March 2011,pp-139-145.

[5] N.Fareena, A.Shunmuga Priya Mala, "Mobility based energy efficient multicast protocol for MANET", Elsevier Ltd Proceeding Engineering 38,pp- 2473 – 2483, ICMOC 2012.

[6] Sunil Taneja and Ashwani Kush, "Energy Efficient, Secure and Stable Routing Protocol for MANET," Global Journal of Computer Science and Technology, Vol. 12, May 2012.

[7] Gerla M., Lee Y. Z., Joon-Sang Park, Yi. Y, "On demand multicast routing with unidirectional links" IEEE Conference on Communication and Networking, pp. 2162-2167,13-17 March, 2005.

[8] Vassileva, N. and Barcelo-Arroyo, F. "A Survey of Routing Protocols for Energy Constrained Ad Hoc Wireless Networks", in IEEE Future Generation Communication and Networking, Dec. 2007, pp. 522-527.

[9] Anuj K. Gupta, Harsh Sadawarti, & Anil k. Verma, (2011) "Review of various Routing Protocols for MANETs," International Journal of Information and Electrical Engineering, ISSN: 1109-2742, Vol. 1 No. 3, pp. – 251-259.

[10] Anuj K. Gupta, Harsh Sadawarti, and Anil K. Verma "A Review of Routing Protocols for Mobile Ad hoc Networks" ACM Journal on WSEAS Transactions on Communications, ISSN: 1109-2742, Volume 10 Issue11, pp. 331-340, 2011, November 2011.

[11] Mrs.C.Priyadharshini and Ms.K.Thamarai Rubini "Predicting Route Lifetime for Maximizing Network Lifetime in MANET" IEEE International Conference on Computing, Electronics and Electrical Technologies (ICCEET), pp 792-797, 2012.

[12] Keshav Nayak and Neelesh Gupta "Energy Efficient Consumption based Performance of AODV, DSR and ZRP Routing Protocol in MANE International Journal of Engineering and Innovative Technology (IJEIT) Volume 4, Issue 11, May 2015.