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## ZBLE: Zone Based Leader Selection Protocol

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### Abstract

Various wireless mobile nodes are simultaneously a network that does not depend on any central administration system. This kind of network is called Mobile Ad Hoc Network (MANET). Due to the nodes dependent on the battery in MANET, energy consumption has become a major problem. Because of the mobility of the nodes in the network, the nodes rapidly change their positions, causing the battery to end very quickly, thereby reducing the life of such a network. The main objective of this paper is to reduce energy consumption and increase the life of the network by modifying the AOMDV protocol using zone-based technology. Keeping this objective in mind, a zone-based protocol was developed which has been addressed in the name of Zone Based Leader Selection Protocol (ZBLE). This proposed protocol uses zone-based technology to select the path based on high energy and high power. For the data forward, selecting the Leader node in each zone, the best path is chosen based on the energy level of the node and the strength of the probe. The proposed protocol has been evaluated using Network Simulator version 2.35. Comparison of ZBLE, protocols the most popular protocols are from AODV and AOMDV. With the help of simulation results, we have used service parameters such as packet distribution ratio, energy consumption, network lifetime and throughput to tell the quality of the proposed protocol.

**Index Terms:** Energy efficient protocol, Mobile Ad-hoc network, multipath routing, Zone Based function.

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## **1. Introduction**

The circulation of communication technologies among wireless mobile nodes has so far advanced in recent years, that all people have become dependent on this. In addition, in the coming days, it is also expected that the use of its applications will be widespread and faster. In the future, there is a possibility of such a topology, which is multi-hop, dynamic, random, and sometimes varies rapidly. These topologies will be made of such wireless links which are increasing the amount of relatively high energy and bandwidth consumption [1]. Many problems like bandwidth optimization, transmission quality enhancement, and power control are inherited directly from the ad hoc network. To prevent these problems, the Internet Engineering Task Force has made several proposals on various methods and protocols [2].

Many standardization efforts are being made to get rid of this problem in academic and industrial undertakings too. In MANETs, depending on the battery of the network nodes, due to the limited battery of mobile nodes, it affects the network. This reduces the life and connectivity of the network. In order to reduce this effect, we need such routing protocols to consider the power and power [3] for mobile nodes, to improve the network's perforations by increasing the life of the network.

Considering the energy consumption, there are several protocols for MANET [4], which select such nodes for forwarding such data in which their batteries have high energy levels, thereby reducing the energy consumption of the nodes. Network life increases. The Multipath Path Protocol enables the source node to forward data from multiple routes. Various route cost and path selection algorithms have been designed for improving energy efficiency and multi-route [5]. The path of multipath routing will reduce the number of search processes. There are also many problems with the multipath routing protocol. Increasing the number of mobile nodes leads to these problems and becomes complicated [6]. The energy sources of mobile nodes are very limited, which causes more energy consumption in data transfer. And the performance of the network starts down. Therefore it is very important to control power consumption by these nodes. This can increase the life of the network [7].

In this paper, we have developed this protocol, keeping in mind this problem, based on zone-based technology and using high energy nodes to help increase the life of the network. This protocol has been addressed in the name of ZBLE which has been used to forward the data using Zone and Leader Node Selection Algorithms. This technology selects the path to energy level and power, from which the best way to select data for forwarding can be selected. We have displayed the ZBLE protocol better than AODV and AOMDV with simulation results here. The remaining paper is organized as follows: Section II and III have presented a literature review and ZBLE protocol in detail. The proposed protocol Methodology and its functionality have been described in Section IV. The proposed algorithm for ZBLE is introduced in Section V. Simulation architecture; environment and simulation results are presented in section VI and VII. Finally, the research has been abolished on section VIII.

## **2. Literature Survey**

Periyasamy, P[8] Has developed the OMMRE AOMDV protocol (Optimized Minimal Maximal Nodal Residual Energy AOMDV). Expansion on the energy-efficient route optimized for the energy-efficient path through the protocol has been discussed. The purpose of this algorithm is to use minimum nodal residual energy and to sort out many of the routes coming from this energy. The route with maximum nodal residual energy has been selected. These protocols ultimately make the average end to end delay, overhead route and normalized route better than other protocols by reducing the energy consumption. Packet delivery ratio and throughput have also been improved.

Varalakshmi [9] KV has consolidated the residual energy of nodes by developing the AOMR-LM protocol (ad hoc on-demand Multipath routing with Lifetime Maximization), which has increased the network life time by balancing the energy consumed with the help. Nodes in the multipath selection system the path is classified by selecting the routes according to the energy level. Network Life by improving the consumption of energy

Networks life has been increased. This protocol delays the lower average end by increasing the network life by consuming less energy. Seetaram, J[10], has designed the EA-AOMDV (Energy AWDV) protocol, which modifies AOMDV. Route has been selected based on node residual energy in the modified protocol. Due to the node residual energy strategy, energy consumption decreases on the route. The link and transmission overhead has also been worked out in detail in this method, on active communication energy. By decreasing the total transmission energy of the packet distribution ratio by this protocol, the delay has finally been abated.

Lutimath, Nagraj M [11], has developed EAMODV (Energy Aware Multipath AODV Protocol) in which he calculated the derived drop rate using the drop threshold. The route has been selected by selecting this energy-sensitive node-discrete multiplex through this protocol, which has improved the result of residual energy of intermediate nodes and node energy, along with the drop rate.

With the help of this protocol, the delay in the end-end-pack, throughput, routing control overhead, packet distribution ratio, energy efficiency, and packet delivery rate has been shown to be better than other protocols.

Taha, Aqeel [12], has developed FF-AOMDV (AOMDV with fitness function). Optimal path has been selected using the fitness function in it. The fitness function is designed by the Particle Swarm Optimization (PSO) algorithm. In the case of primary route failure, alternative route has been used with wireless sensor network. This protocol has been evaluated with AOMR-LM and AOMDV. Through this protocol, the simulation result is better performance in throughput, packet distribution ratio and end-to-end delay. This protocol has played a good role in the energy and better network life span.

Ai [13] has demonstrated the transmission power of nodes and residual energy by developing the EEM-AOMDV (energy-efficient multipath routing protocol for the wireless mobile ad hoc network). In this protocol, two matrix of transmission power and residual energy is integrated into AODDV. After simulating this protocol, the network life and time has been increased by reducing the consumption of energy.

Sharma [14], invented the e-AOMDV (energy efficient AOMDV) protocol. By reducing energy conservation through this protocol, the smallest way and weight balance were focused. By using the energy factor to obtain the best path in this protocol, small and best paths have been obtained by the products of energy nodes of all nodes. Its lifetime is limited but without the energy factor, AODDV has shown a better route.

Duraiswamy [15] had developed the PAMPMAODV (Power-Aware Multiple Path Multicast Ad hoc On-Demand Distance Vector Protocol) protocol. Through this protocol the battery was used effectively. This protocol has improved hop count, end-to-end delay and residual battery capacity, by preventing unnecessary control messages. Weight balance and minimum power consumption were also controlled by this protocol.

Jain, Jay Kumar, [16] developed a new hybrid protocol. The AODV and Optimized Link State Routing Protocol were considered in this protocol. This protocol was evaluated with AODV, OLSR and ZRP. After the simulation, it was found that the results of this protocol were displayed better than other protocols.

### **3. Zone Based Leader Selection Protocol (ZBLE)**

The protocol has been developed using zone-based technology. This protocol based on network decomposition has been deployed in various zones in embedded areas. For the multipath routing in the ad hoc network, many protocols have already been designed to keep the energy in mind. But in these protocols the energy consumption was not given much attention. The main purpose of making this protocol is to keep energy in mind, to increase the network. This protocol is based on the state of energy, power and node. The main purpose of implementing this protocol is to choose the best energy route. In Figure 1 we have understood the block diagram of this protocol. The protocol represents MANIT network, so this scenario is designed under MANET. Random mobility model has been used here for the purpose of transferring nodes randomly. There are many pathways available through multipath technology. But with the help of Zone Based Technology, we have selected some best paths. This zone-based model is built under multipath routing. Zone-based models have been implemented with the help of energy label, position tracking, and power analysis. In Zone Based Technology, we are selecting the best path by getting the Zero Leader node and Zone Members' access to data forwarding. Leader node has been selected from the help of energy labeling and positioning tracking factors.

After selecting the Leader node, zone-based technology has been optimized to find the best path by classifying the power analysis into lower, medium and high-level three labels.

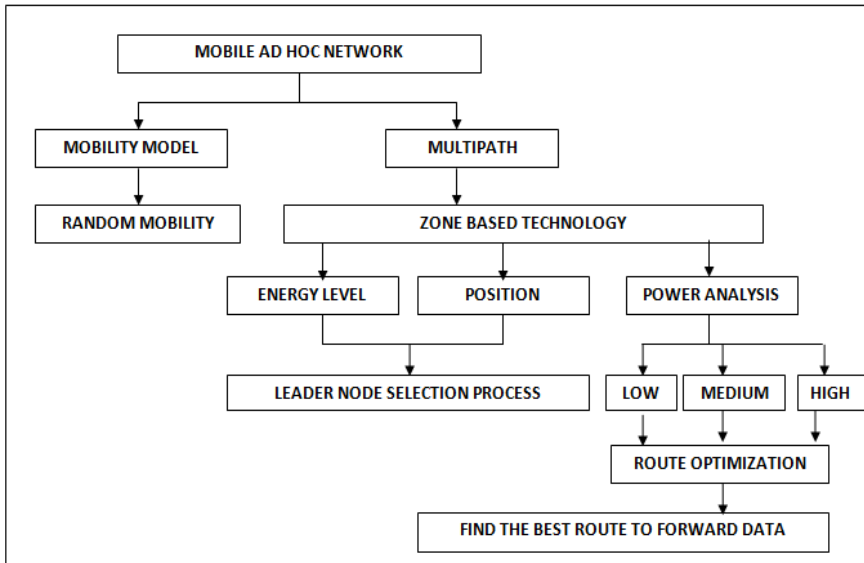


Fig.1 Block diagram of ZBLE

#### 4. Methodology

The nodes present in MANETs are not stable and they dynamically change their place. Therefore multipath routing is a very difficult process due to the constantly changing network topology and link capability. The ability of data processing, computational power and data storage is the same in every node. Therefore, we have implemented a new Multipath Routing Protocol, which is called Zone-based Leader Selection Energy Constrained AOMDV Routing Protocol (ZBL), which is based on zone-based technology. This protocol identifies the best path by selecting the leader node and members of the zone on the basis of protocol energy. The approach of the proposed protocol is different from the existing methods. From this perspective, the AODV protocol has been improved. Depending on the choice of residual energy and leader nodes, any sender will forward the data, thereby reducing energy conservation; here the performance of the proposed system is indicated by the flow chart in Figures 2.

The flow of works described in Figure 2 above in the above mentioned diagram is explained by the flow chart. Mobile ad-hoc networks are built using a zone-based model. Depending on threshold value, the energy of the nodes is checked whether the node is able to transmit or not. If the node is less than the energy power threshold, it means that it is not able to transmit the node. The node will be able to communicate only if it is more or equal to the power threshold. Power analysis means transmission power and reception power. If the cost of transmission power exceeds RSS (Received Signal Strength) then the route should be selected and processed, otherwise, if it does not have any means then it will not be included in the communication.

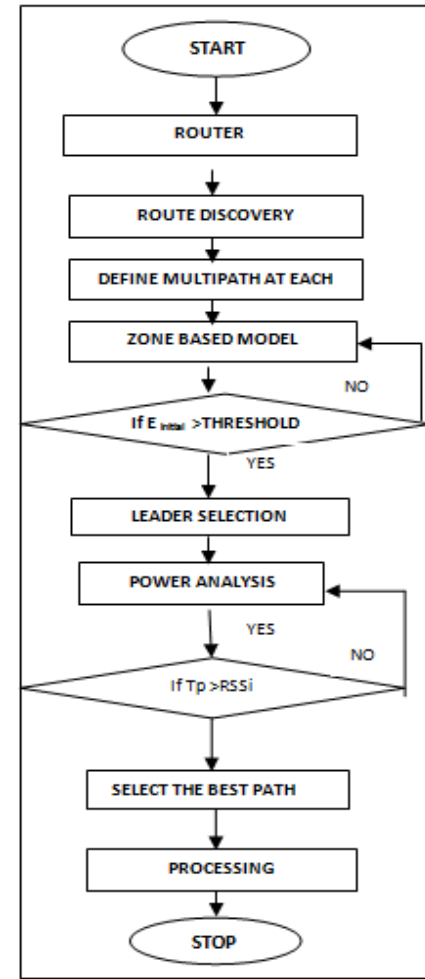


Fig.2.Flow Chart of the ZBLE

## 5. Proposed Algorithm

Here, this zone-based model is explained with the help of algorithm. No need to get the address of the source and destination to communicate in the network. After identifying the source and destination, the model has been implemented in the second phase. In this we have obtained the information of the nodes by using the dynamic model to determine the beginning and end position of the node such as the number of nodes in each zone, election of leader nodes and information of neighboring nodes can also be obtained by this model. The representation of the power signal has been checked after the election of the leader node and zone members. Forwarding by analyzing the power analysis on the basis of the Leader node, transmission power and reception power, the forwarder node is selected using the maximum density, minimum density and maximum packet size in the forwarder node choice method. The best path has been chosen using RSS pricing. Each node should have the following characteristics:

Speed: Node Velocity  
 Power signal: Signal power of node  
 Gap: Distance between special node and destination  
 Condition 1:  
 Speed: slow power signal: high interval: small  
 Condition 2:  
 Speed: medium power signal: medium interval: minimum  
 Condition 3:  
 Speed: High Power Signal: Low Gap: Large

To solve the above stated problem the following steps are preformed:

Step: 1 Initialize the Network with N nodes and define source and destination  
 Initialization src, dst  
 Step: 2 Mobility model  
 If  $m_i (S_i S_j)$ , then src->nid vel (i, j); If, then speed (S<sub>i</sub> S<sub>j</sub>)  
 Step: 3 Leader node selections  
 Node\_id. Update Range (E<sub>i</sub>,p<sub>i</sub>)  
 for db in neighbour do  
 If nid (P<sub>i</sub>), then src->nid k(i,j); If, then mn (E<sub>i</sub>) nid.  
 Step: 4 Power analyses  
 Leader node analyze the power level of the neighbors in their vicinity  

$$n_i(1)+n_i(2)+\dots+n_i(n)=t_i(n)$$

$$n_i(1)+n_i(2)+\dots+n_i(n)=r_i(n)$$
 t<sub>i</sub>,r<sub>i</sub>->transmission and reception power of the node  
 for index in [0, ..., List.length() - 1] do  
 group of nodes= nodeList[index]  
 forwarder\_selection = FindCandidateSeeds(nid, nid (1))  
 for range in network do  
 node\_radius = 0.075  
 Step: 5 Forwarder node selections.  
 if (RSSI > max Density) or (new Density == RSSI and range < max Range Size) then  
 maxDensity,maxIndex = high\_level  
 max\_pktsize = normal\_level  
 max\_iterations = low\_level  
 Step: 6 End Process

## 6. Proposed Architecture

Due to the availability of limited wireless channels, energy problems of nodes in the wireless network are a challenging issue. In this architecture, the design and their connectivity of various modules are shown. Various scenes of the proposed protocol are defined in figure 3. In internal views, we generate object files by updating the Zone module with AOMDV protocol. Using the NS-2 simulator, these object files are provided with TCL (Tool Command Language). Network simulation, trace file, and output files are generated after running the simulation. The designated protocol is designed by NAM file in the design animation. And with the help of AWK script, node information has been calculated.

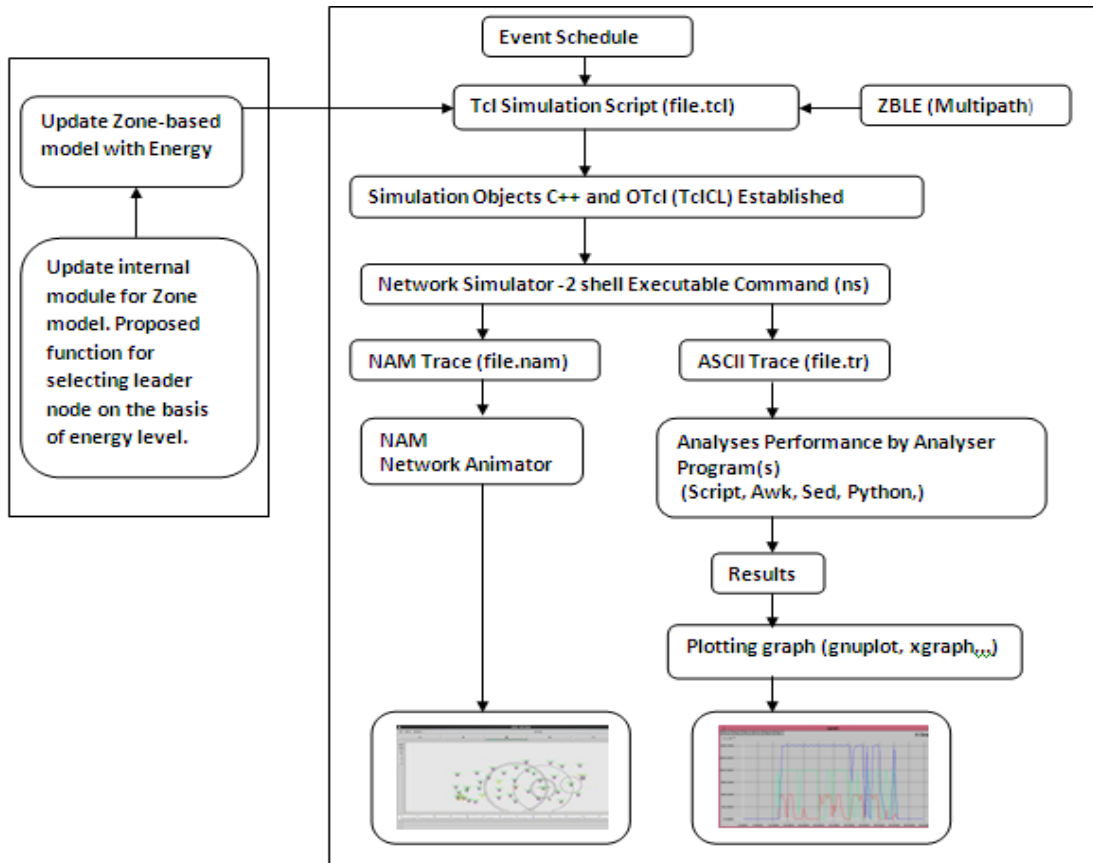


Fig.3. Proposed Architecture of ZBLE

## 7. Simulation Scenarios

Work has been evaluated by using the proposed protocol (ZBLE) using three scenarios such as node speed, packet size and simulation time. In the simulation, 100 mobile nodes in the 1507X 732 meters network area have been randomly presented. Support CBR as a traffic source. The initial energy of each node has been set to 50 joules. The performance of the proposed ZBLE protocol has been chosen to see how it affects the performance of the protocol through three different scenarios. In the first scenario, we displayed the packet size (512, 768, 1024, 1280, 1536 bytes). In the second scenario, the speed of the node is set to 0, 5, 10, 15 and 20 meters / second and in the third scenario, the simulation time is set as 10, 15, 20, 25 and 30 seconds. All simulation parameters are presented with the help of Table 1.

Table 1. Various Simulation Scenarios

Scenario Elements	Values	Unit
Number of nodes	100	Nodes
Node speed	0, 10, 15, 20, 25, 30	Meter/second
Queue size	50	packets
Simulation area	1507 * 732	Meter <sup>2</sup>
Routing protocols	AODV, AOMDV, ZBLE	Protocol
Mobility model	Random way point	
Packet size	512, 768, 1024, 1280, 1536	Bytes
Traffic type	CBR	
Initial energy	50	Joules
Transmission power consumption	0.035	Joules
Receive power consumption	0.035	Joules
Idle Power	0.100	Joules
Sense Power	0.0175	Joules
Simulation time	30	seconds

## 8. Results and Discussions

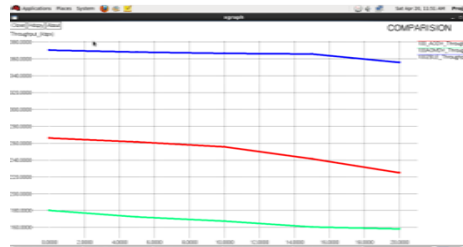
We have been evaluating the proposed algorithm through different performance metrics below:

### 8.1 Throughput:

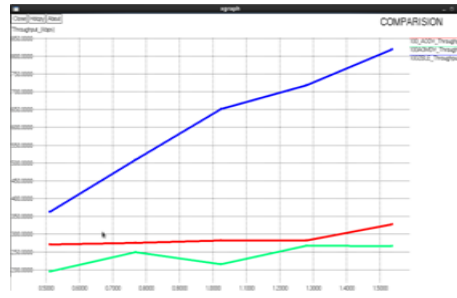
In the network, throughput analysis is done through the number of successful data packets or bits received at the destination per unit time. The display unit of the network is measured by time. In this network, the throughput of the ZBLE routing protocol is much better than the normal energy route due to zone-based technology and optical energy-based routing. To demonstrate the effectiveness of the routing protocol, the throughput testing in the network metric parameters is the main performance metric.

The speed of mobile nodes in Fig.4 (a) is displayed simulations using values of 0, 5, 10, 15 and 20 meters / second. The flow of three protocols depends on the speed of the node. The throughput of the ZBLE routing protocol is higher than the AOMDV and AODV protocols, because this protocol selects the appropriate active routes through the Zone Technologies, using more energy levels. Size of packet in Fig.4 (b) (512, 768, 1024, 1280, 1536 bytes) Throughput is displayed by simulating. The performance of the ZBLE routing protocol is better than both AODV and AOMDV. Due to high energy nodes and zone-based technology, ZBLE has been able to maximize throughput. Through Fig.4 (c), through different simulation time (10, 15, 20, 25 and 30 seconds), the three routing protocols have been shown to be throughput for ZBLE, AODV and AOMDV. Compared to both AODV and AOMDV protocols, the ZBLE protocol has performed better in the case of throughput. Increase through simulation time also increases throughput. The maximum level of input is energy-rich, with a strong and stable path, which has been achieved by reducing the dropped packets in ZBLE protocol.

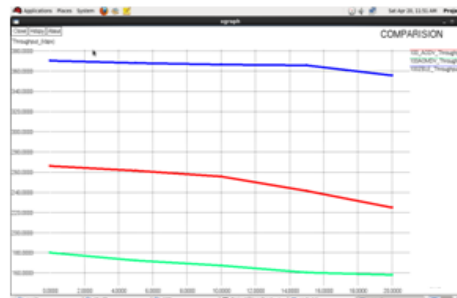




(a)



(b)



(c)

Fig.4. Throughput (a) Node Speed (b) Packet Size (c) Simulation Time.

## 8.2 End to End delay

The difference between end-to-end delays in fig. 5 (a) is shown by ZBLE, AODV and AOMDV protocols with the different moving speed of the nodes. The change of end-to-end delay in fig. 5 (b) is shown by increasing numbers of packets (512, 768, 1024, 1280 and 1536 bytes) for end-to-end delay protocols for ZBLE, AODV, and AOMDV. With the size of the packet growing, end-to-end delays have also increased. ZBLE routing protocols perform better than both AODV and AOMDV protocols. In fig. 5 (c), the end-to-end delay is indicated by simulation time (10, 20, 30, 40, 50 seconds), compared to AODV and AOMDV compared to the three protocols ZBLE, AODV, and AOMDV. The ZBLE routing protocol performs better because the source node always selects routes using the maximum energy node.

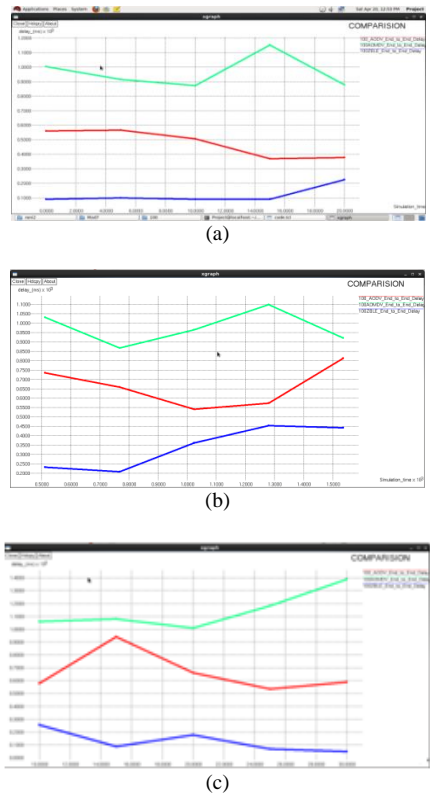
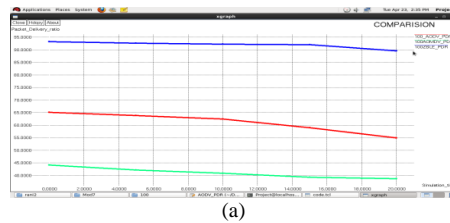


Fig.5. End-to-end delay (a) node speed (b) packet size (c) simulation time.

### 8.3 Packet delivery Ratio

The difference in packet distribution ratio in fig 6 (a) is shown by the protocol ZBLE, AODV and AOMDV as the speed of the node, (0, 5, 10, 15, 20 m / sec). Variation of packet distribution ratio in Fig 6 (b) is shown with the size of different packets (512, 768, 1024, 1280 and 1536 bytes) by the ZBLE, AODV and AOMDV protocols. Remove routes with more energy-driven reliable routes and zone technology. In the fig 6 (c) packet distribution ratio, in different simulation times (10, 15, 20, 25 and 30 seconds), the routing protocol is displayed by ZBLE, AODV and AOMDV. The ZBLE protocol lowers high energy, strong and zone-based routing packet traffic, increasing data traffic. In the three scenarios, the display of the ZBLE protocol is performing better than both AODV and AOMDV protocols.



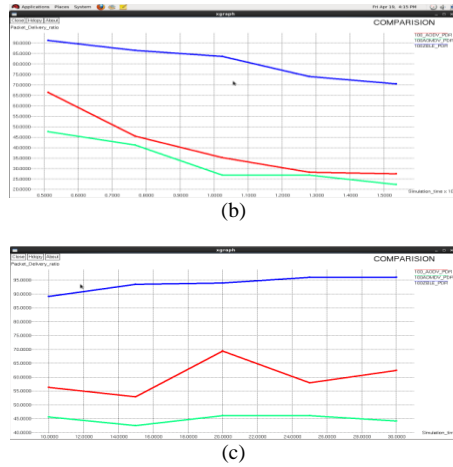
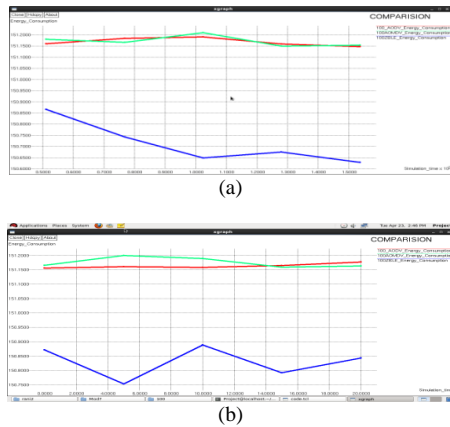


Fig.6. Packet Delivery Ratio (a) node speed (b) packet size (c) simulation time.

### 8.4 Energy Consumption

Energy consumption in fig 7 (a) is displayed by the routing protocol ZBLE, AODV and AOMDV with the size of individual packets (512, 768, 1024, 1280 and 1536 bytes). The difference of energy consumption in fig 7 (b) is indicated by ZBLE, AODV and AOMDV, in which the speed of different nodes (0, 5, 10, 15, 20 m / s) is indicated. As the speed of the node increases, energy consumption also increases. ZBLE protocol consumes less energy than both AODV and AOMDV. ZBLE selects routes based on the level of energy and the leader node by classifying the network in the protocol zone. Fig 7 (c) in energy consumption, different simulation time (10, 15, 20, 25 and 30 seconds), and proposed protocols are represented by ZBLE, AODV and AOMDV. ZBLE protocols are much better than both AODV and AOMDV in all the condition.



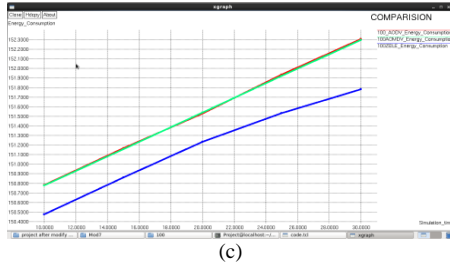
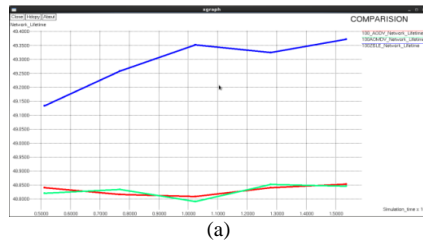


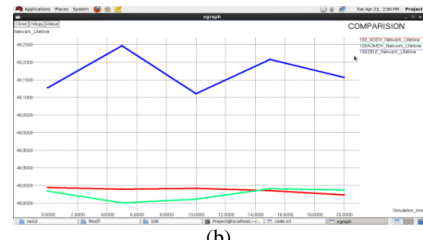
Fig.7. Energy consumption (a) node speed (b) packet size (c) simulation time.

### 8.5 Network Lifetime

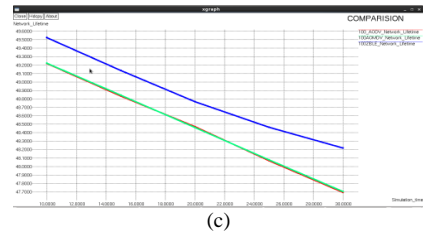
Routing protocols with individual packet size (512, 768, 1024, 1280 and 1536 bytes) on the number of exhaust nodes in Fig 8 (a) are represented by ZBLE, AODV, and AOMDV. By distributing the traffic load by classified route, more energy protection is required. The difference of the exit nodes in fig 8 (b) is indicated by the routing protocol ZBLE, AODV and AOMDV with the speed of different nodes (0, 5, 10, 15, 20 m / s). In Fig 8 (c), the number of nodes ending in simulation time (10, 15, 20, 25 and 30 seconds) is indicated by the routing protocol ZBLE, AODV, and AOMDV. Then, ZBLE performs better by preserving more energy than both AODV and AOMDV. ZBLE's network life improves because of better energy conservation and elimination of low node. The ZBLE routing protocol has been better demonstrated than both AODV and AOMDV.



(a)



(b)



(c)

Fig.8. Network lifetime (a) Node Speed (b) Packet Size (c) Simulation Time.

Here we can compare performance enhancements by displaying all the enhancements in the form of tables. With the help of the following tables, we compare performance metrics on different simulation scenarios. By comparing the proposed algorithm with various existing protocols in this table, we found the ZBLE protocol best.

Packet Size	Throughput			Speed	Throughput			Simulation Time	Throughput		
	AODV	AOMDV	ZBLE		AODV	AOMDV	ZBLE		AODV	AOMDV	ZBLE
512	271.39	194.78	363.04	0	266.28	180.31	370.70	10	150.52	121.72	245.00
768	275.27	249.43	509.15	5	261.32	172.51	368.14	15	216.20	173.64	371.55
1024	282.58	215.20	652.01	10	255.64	167.26	366.58	20	382.47	253.80	490.15
1280	282.53	267.63	718.64	15	241.46	160.59	365.73	25	401.62	318.92	619.96
1536	328.21	266.39	819.49	20	224.72	158.04	355.80	30	521.08	368.71	738.42

Packet Size	End-to-End delay			Speed	End-to-End delay			Simulation Time	End-to-End delay		
	AODV	AOMDV	ZBLE		AODV	AOMDV	ZBLE		AODV	AOMDV	ZBLE
512	734.425	1031.09	232.22	0	560.068	1003.67	89.9926	10	579.79	1061.11	256.695
768	659.563	868.253	206.751	5	565.72	915.734	98.8659	15	940.768	1079.9	87.9443
1024	540.396	964.6	360.982	10	506.016	871.775	89.341	20	662.81	1008.82	177.819
1280	572.838	1099.83	452.763	15	369.888	1153.01	91.0107	25	535.12	1182.67	68.5571
1536	812.071	920.625	442.826	20	377.303	878.723	225.257	30	588.861	1389.71	47.868

Packet Size	Packet delivery ratio (PDR)			Speed	Packet delivery ratio (PDR)			Simulation Time	Packet delivery ratio (PDR)		
	AODV	AOMDV	ZBLE		AODV	AOMDV	ZBLE		AODV	AOMDV	ZBLE
512	66.3315	47.6075	91.3602	0	65.0832	44.0707	93.2881	10	56.3163	45.5414	89.0665
768	45.423	41.1581	86.5048	5	63.8696	42.1637	92.6455	15	52.8433	42.4411	93.5023
1024	35.1942	26.8031	83.613	10	62.4827	40.8807	92.2528	20	69.413	46.0608	93.988
1280	28.2594	26.7684	74.0093	15	59.0153	39.251	92.0386	25	57.9648	46.0278	96.0229
1536	27.4272	22.2607	70.5105	20	54.9237	38.6269	89.5395	30	62.4235	44.1706	95.9624

Packet Size	Energy consumption			Speed	Energy consumption			Simulation Time	Energy consumption		
	AODV	AOMDV	ZBLE		AODV	AOMDV	ZBLE		AODV	AOMDV	ZBLE
512	151.16	151.18	150.866	0	151.156	151.166	150.872	10	150.781	150.778	150.475
768	151.184	151.166	150.742	5	151.161	151.2	150.753	15	151.168	151.157	150.863
1024	151.191	151.21	150.648	10	151.158	151.189	150.889	20	151.529	151.539	151.233
1280	151.159	151.149	150.675	15	151.165	151.159	150.792	25	151.933	151.921	151.534
1536	151.147	151.154	150.628	20	151.177	151.163	150.843	30	152.308	152.297	151.781

Packet Size	Network Lifetime			Speed	Network Lifetime			Simulation Time	Network Lifetime		
	AODV	AOMDV	ZBLE		AODV	AOMDV	ZBLE		AODV	AOMDV	ZBLE
512	48.8401	48.82	49.1338	0	48.8443	48.8337	49.1279	10	49.2187	49.2223	49.5255
768	48.8165	48.834	49.258	5	48.8395	48.8002	49.2474	15	48.8319	48.843	49.137
1024	48.8087	48.7903	49.3519	10	48.8416	48.8113	49.1109	20	48.4706	48.4612	48.767
1280	48.8407	48.8514	49.325	15	48.835	48.8411	49.2082	25	48.0674	48.0788	48.4656
1536	48.8529	48.846	49.3724	20	48.823	48.8368	49.1574	30	47.6918	47.7026	48.2193

## 9. Conclusions

Multipath routing is difficult because of the low network capacity of data storage, data processing and computational power in the network like MANET. Due to the lack of energy in the node, the battery is not used efficiently. The efficient use of batteries is important for increasing the life of the network. In this research, we have proposed a zone-based new energy efficient multipath routing algorithm called ZBLE. This is a protocol based on Zone Technology, which has been simulated using NS-2.35. These scenarios are tested by 5 performance metrics packet delivery ratio, throughput, end-to-end-delay, energy consumption and network

lifetime. The results of the simulations have shown that the proposed ZBLE is displaying better results than current AOMDV and audio protocols. ZBLE is an amazing activity to help maximize the life of the network.

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