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ZBLE: Zone based Leader Selection Energy Constrained AOMDV Routing Protocol

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Abstract

In today's life, wireless networks (WNs) are being used very fast in every area. Wireless networks have been used in various applications, but finding some of its weaknesses, such as mobility, diversity, lack of resources and so on, finding an optimum route is very complex and problematic. By reducing the energy consumption on each node, the quality of the network can be ensured. Need to increase the battery life of the node to increase the network lifecycle. Therefore, reducing the energy consumption can extend the battery life of the node. To find and maintain routes between nodes, multi-path routing is a fundamental research issue for such networks. This paper discusses the zone-based routing protocol, which uses the energy, distance and power of the node to maintain high circulation and accelerate the path search process and maintain high search. The Zone-based Leader Selection Routing Protocol (ZBLE) is one of the new protocols, which is a modified form of the famous Ad Hoc on Demand Distance Vector Routing Protocol (AOMDV). Zone Leader Node and Zone Members are selected using the value of energy, position and power of the node. The performance of the proposed communication protocol is evaluated with other existing protocols such as AODV and AOMDV. The simulation result is that when it receives the best path for data communication with proper energy conservation. Network simulator version 2.35 is used for simulation purpose. To support our ideas, we used the 5 quality of service parameters such as packet distribution ratio, energy consumption, network lifetime, and throughput.

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

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1. Introduction

Routing protocols can be classified into three parts: reactive, active and hybrid in the MANETs [40]. In the reactive routing, the paths are determined on the request and the nodes have no prior knowledge of the destination nodes. In active routing, evaluates the paths for each node in the network and each node continuously checks. In hybrid routing, uses zones and cluster-based routing. The purpose of this routing is to reduce the vulnerabilities of the active approach and exploit the powers.

The use of communication technologies between wireless devices and these devices has advanced in recent years. In addition, it is also expected that the use of mobile wireless computing and applications will be increasingly widespread. Most future developments are likely to have such a topology, which is multi-hop, dynamic, random, and sometimes varies rapidly.

Ad Hoc Networks are made of mobile nodes that communicate on wireless links without central control. Such networks are important in the development of wireless networks. Due to multi-hop nature, lack of fixed infrastructure, and self-route, and many problems are inherited directly from the ad hoc network. Such as bandwidth optimization, transmission quality enhancement and power control [1]. The Internet Engineering Task Force has made several proposals on various methods and protocols to prevent these issues. And even many standardization efforts are being made in academic and industrial undertakings [2]. In MANETs, mobile nodes have an impact on the network due to the limited battery. Due to the limited battery, network connectivity and its lifetime decreases. A routing protocol based on energy and power [3] is needed to extend the life of the network and strengthen network connectivity. There is a protocol to increase the network life, which selects such nodes to carry forward the data in which their batteries have high energy levels. And such protocol nodes reduce energy consumption. Using such protocols in MANET [4], different route cost and path selection algorithms have been examined, which aims at improving energy efficiency. During the past years, many multi-path routing protocols have been developed, designed to increase the life span of a path and increase network performance. [5]

The Multipath Path Protocol is one of these incidents, which enables the source node to choose the best route from multiple routes during the single path search process. The path of multipath routing will reduce the number of search processes. If someone fails, another good route can be chosen with the help of the backup route. Use of multipath technology will reduce end-to-end delay, energy consumption, and network life will increase. [6] There are many problems with multipath routing protocols. It is not necessary that the source will always be available optimal or shortest way. These problems become more complex with a large number of mobile nodes. In this case, most energy is being consumed at the time of testing the lowest routes. After this, more energy is lost on data transfer. Because the power source of mobile nodes is limited, so the energy consumption should be controlled by these nodes to increase the life of the network [7]. It offers paper zone-based energy efficient multipath routing protocol called Zone Based Leader Selection Energy Constrained AOMDV Routing Protocol (ZBLE). This protocol selects all the zones on the basis of energy level and power to forward the data using the Zone Creation and Leader Node Selection Algorithms, from which the best path for data forwarding can be chosen. Based on some of our current simulation results, ZBLE performances have been compared against other standard routing protocols like AODV and AOMDV. Both protocols are the most popular protocols used in mobile ad hoc networks. These protocols have been standardized by the Internet Engineering Task Force (IETF). These protocols are well tested for real-world applications. Because of these reasons, they have been selected to compare their performance against ZBLE.

In this paper, we offer a modern routing approach that can consider zone-based techniques for energy conservation and best path analysis. Not only considering energy, but by designating a multipath routing approach by fulfilling the routing process in an efficient way, the main challenge is to do this. In order to fulfill this challenge, this letter is organized as the following. Section I has presented ZBLE protocol in detail.

The proposed protocol ZBLE and its functionality have been described in Section II. Methodology and Proposed algorithm for ZBLE is introduced in Section III and Section IV. Section V presents and the simulation environment and simulation results. Finally, section VI concludes on research.

2. Zone Based Leader Selection Energy Constrained Aomdv Routing Protocol (Zble)

Our protocol is based on zone-based technology and relies on network decomposition in embedded areas. Although many routing protocols have been designed for Ad hoc Networks, the importance of implementing this protocol is that we are implementing the energy, power and position of the node to choose the best energy route for sending data packets.

In figure1 the block diagram is shown representative of zone based technology.

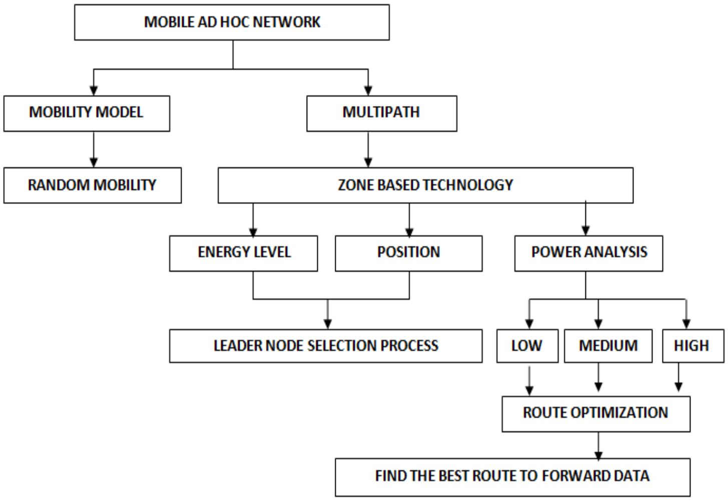

Fig.1. Block Diagram of the ZBLE

Our scenario is built under MANET, so it represents the MANIT network. Here the Random Mobility model has been taken, which allows the nodes to move randomly. Between the source and the destination, we get many paths from multipath technology. But in these ways, we have to choose some optimize path. The zone-based model is coming under multipath routing. There are three categories to work with this zone-based model, how to implement a zone-based model with the help of multiple paths, energy labels, position tracking, power analysis.

We will get a selection of the best path through which we will be able to achieve zone based technology. In this process, we will select the path based on the zone created by its members and leader node. Zone Leader Node and Members node are selected by keeping in mind two factors. Energy labeling and positioning tracking mean the distance.

Leader node can be selected only after the assumption of energy label and position tracing. After selecting the Leader node, the power analysis is classified into three labels, low, medium, and high.

Based on these three labels, it has been decided that which node should be appropriate to carry out the data? Here, the route has been adapted to the zone based technique with the help of many routing, energy label, position tracking and power analysis.

3. Methodology

Multipath routing in MANETs is difficult due to the constantly changing network topology and link capability. There are some properties in the nodes of MANETs which are as follows: The nodes are not stable and they dynamically change their place. Every node has the same capability in the duration of data processing, computational power, and data storage. Due to these properties, the energy of the node decreases which affects the efficiency of the network.

This applies a new multipath routing protocol, which is called Zone-based Leader Selection Energy Constrained AOMDV Routing Protocol (ZBLE) with a zone-based routing protocol, which is a combination of zone-based and leader selection functions.

Our approach is proposed, which is different from the existing methods. In this approach, the performance of the AOMDV protocol improves performance based on the selection of zone-based leader nodes. Now whenever a sender wants to send data, he uses several methods and every time he measures and stores the selection of residual energy and leader nodes. Here we reduce energy conservation and increase the percentage of receiving data in the network. In traditional AOMDV, RREQs use several paths. Energy is not kept in mind to choose these paths. Here the functioning of the proposed system with the help of Figures 2 is shown by the flow chart.

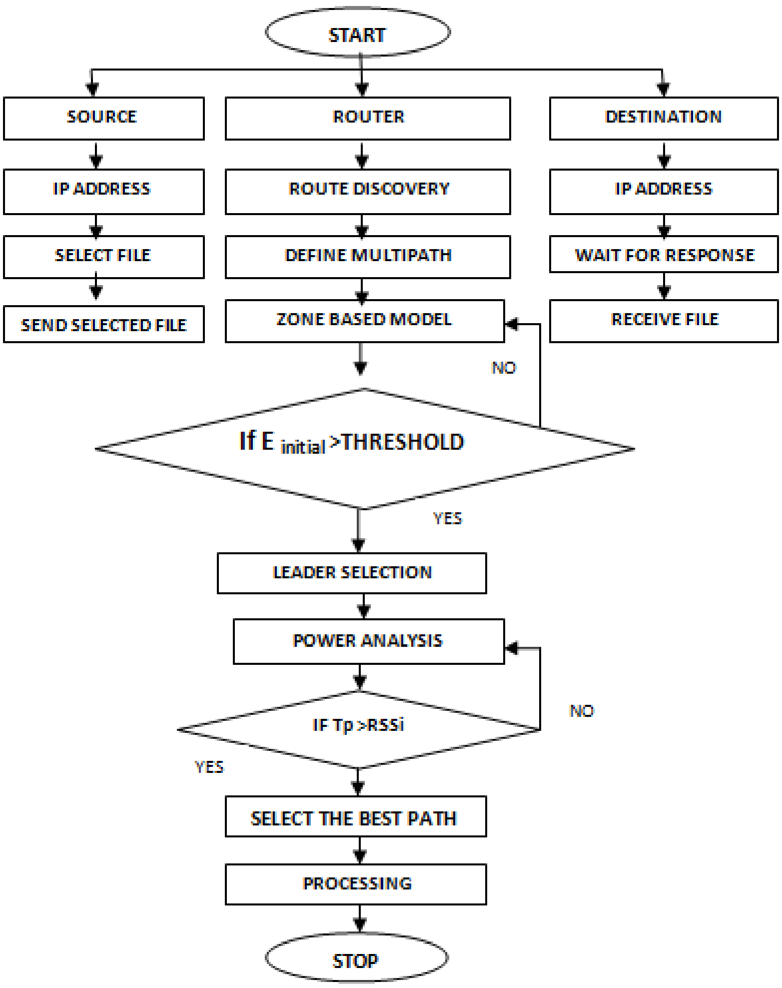

Fig.2. Flow Chart of the ZBLE

In this figure 2, we have tried to understand this technique with the help of the flow diagram. This flow diagram presents the flow of the functions described in the above-mentioned block diagram. Mobile ad-hoc is implemented using the zone-based model here. Here is some energy in all the nodes. Based on the Threshold value in this model, it has been decided that any node is capable of making the transmission. All nodes have some battery labels but the initial battery labels that we can give. Therefore, each node has been labeled the initial battery, and this energy label gradually decreases. We cannot predict energy labels. Node transmission power is obtained on the basis of its energy strength.

If the energy is lower than the power threshold, it means that a special node is not capable of transmitting due to the low amount of energy node. And if the energy is greater than or equal to the power threshold, it means that the special node is able to transmit and communicate. If the node with a value greater than threshold value is found, then it should be selected as a leader node or else go back to the zone-based model. Now the power has been analyzed. Power analysis means transmission power and reception power. If the cost of transmission power is higher than RSS (Received **Signal Strength**), then the route should be chosen and processed, otherwise if it does not have any instrument then it returns power analysis.

4. Proposed Algorithm

The help of algorithm is showing Zone based technology in this section. Whenever we have to communicate in any network, we need to search for a source and destination. Therefore the source and destination have been initially initialized. The second stage is the mobility model. With the dynamic model, the position of the node is detected and we can easily find out the beginning and end position of all the nodes through this model. How many nodes are in every zone the selection of leader nodes and the information of neighboring nodes can also be obtained by this model, how many nodes in the range of their zones can help to forward the data. And we can also make that node a leader node. After selection of Leader node and Zone Members, it has been checked to represent the power signal. Leader node collects forward nodes by analyzing power analysis on the basis of transmission power and reception power. The forwarder selects the forwarder node using the max density, minimum dentistry and maximum packet size in the node selection method. Using the RSS value, selecting the forward node, the best path has been selected.

Every node should have these following characteristics:
Speed: Node velocity
Power signal: Signal strength of the node
Gap: Distance between the particular node and destination
Condition 1:
Speed: Slow Power signal: High Gap: small
Condition 2:
Speed: Medium Power signal: Medium Gap: 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 mi (Si Sj) , then src->nid vel(i,j) ; If , then speed (Si Sj)
Step: 3 Leader node selections
Node_id. UpdateRange (Ei,pi)
for db in neighbhour do
If nid (Pi) , then src->nid k(i,j) ; If , then mn (Ei) nid.
Step: 4 Power analyses
Leader node analyze the power level of the neighbors in their vicinity
ni(1)+ni(2)+…ni(n)=ti(n)
ni(1)+ni(2)+…ni(n)=ri(n)
ti,ri->transmission and reception power of the node
for index in [0, ..., List.lenдth() − 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 == RSSIand range < max Range Size) then
maxDensity,maxIndex = high_level
max_pktsize = normal_level
max_iterations = low_level
Step: 6 End Process

5. Simulation Results

A. Simulation Scenarios

Table 1. Various Simulation Scenarios

Scenario Elements	**Values**	**Unit**
Number of nodes	100	Nodes
Node speed	10, 15, 20, 25 , 30	Meter/second
Queue size	50	packets
Simulation area	1507 * 732	Meter2
Routing protocols	AODV, AOMDV, ZBLE	Protocol
Mobility model	Random way point	
Packet size	512	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

In this simulation model, we have used a Constant Bit Rate (CBR) as a traffic source with 100 mobile nodes, which are randomly presented in the 1507 meters * 732 meters network area. The initial energy level has been set for 50 JU. We have given the simulation time like 10, 15, 20, 25, 30 seconds. And the size of the node speed and packets is set to 3 m / s and 512 bytes, respectively. The simulation time is set to 30 seconds.

B. Performance Parameters

To evaluate the performance of our proposed algorithm, different Performance metrics are considered here:

1) Packet Delivery Ratio (PDR):

This is the ratio of data packets, which were transported to the destination node, to the data packets generated by the source.

Figure 3 shows the graph of the packet Delivery ratio simulation time and the different simulations for ZBLE, AOMDV and AODV routing protocols reflect the variation of the packet Delivery ratio at the time. Simulation time is varied as 10, 15, 20, 25 and 30 seconds.

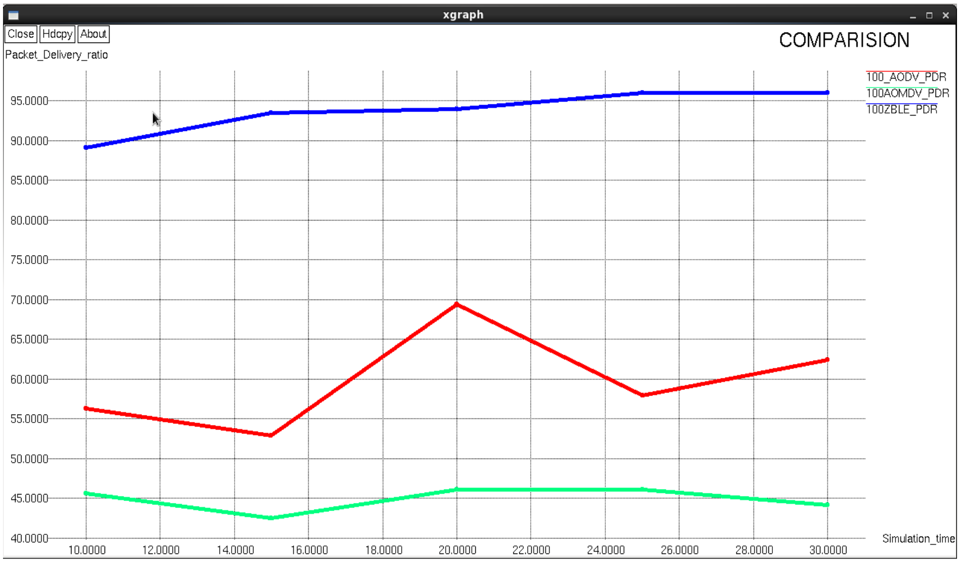

Fig.3. Graph of packet delivery ratio with simulation time

Despite the failure of any opportunity or route, ZBLE has a high PDR. These PDRs are high due to the availability of several paths. As the simulation time increases, the packet Delivery ratio also increases. Compared to both AODV and AOMDV protocol, ZBLE has a better performance in terms of packet delivery ratio.

1. Throughput

Throughput is known as the number of bits that the destination has successfully received.

In fig 4, the on-axis shows the simulation time and throughput on the Y-axis. With the help of this figure, we have shown the effect of throughput on different simulation times. The simulations are varied as May 10, 15, 20, 25 and 30 seconds. When the simulation time increases, the throughput is also increased. Better performance in the throughput of the ZBLE protocol than both AODV and AOMDV protocols.

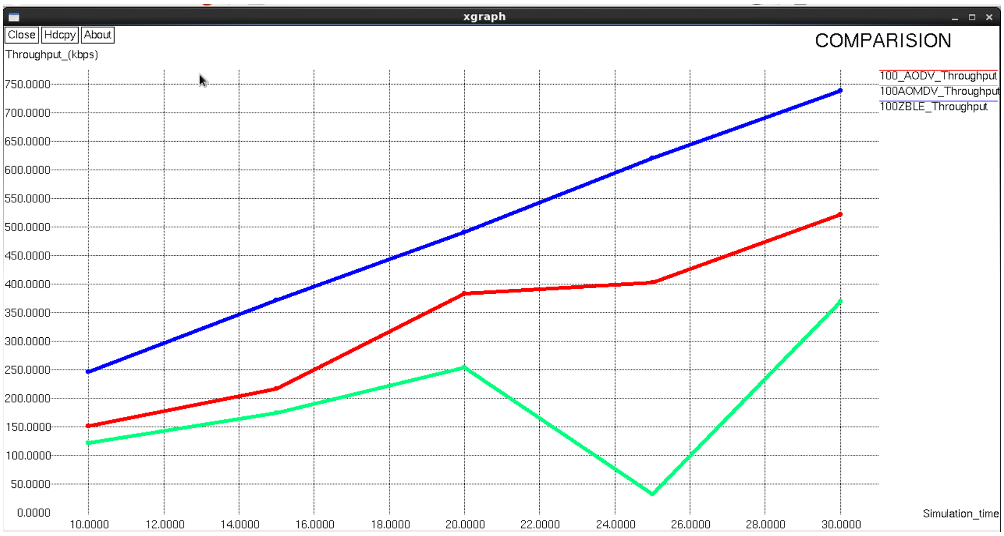

Fig.4. Graph of throughput with simulation time

2. End-to-End delay

The average time of successfully carrying end-to-end delay by the data packet is successfully transmitting messages from source to destination. This includes all types of delays, such as the packet queue in the interface queue; Time of promotion and transfer time; and buffering during the root discovery latency.

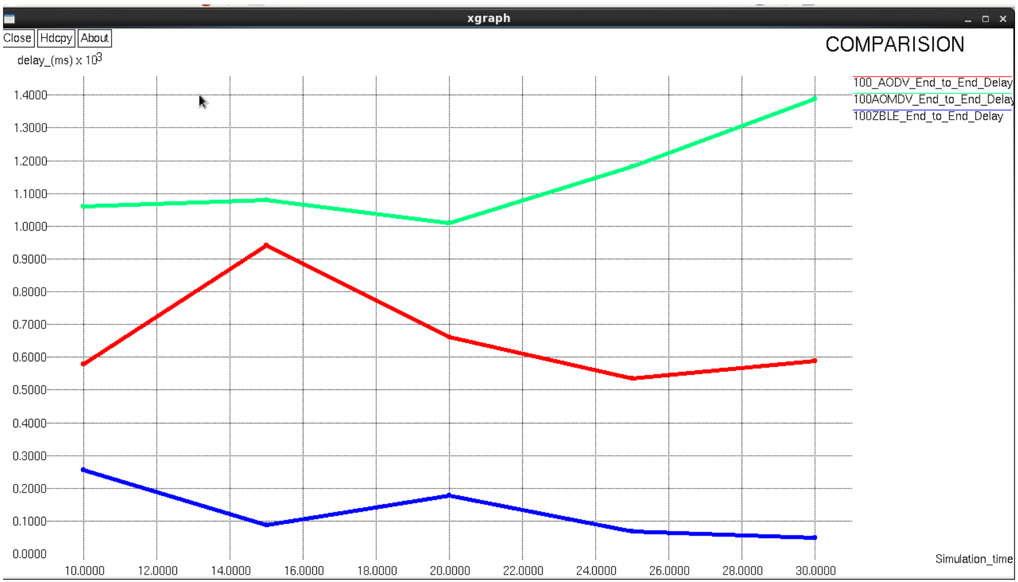

Fig.5. Graph of End to end delay with simulation time

ZBLE (Zone-based Leader Elections Constructed AOMDV) tries to find an alternate route to the destination so that whenever a link breaks, the end-to-end delay of ZBLE is lower than AOVDV and AODV. Figure 5 shows the end-to-end delayed version and is showing better performance. The end-to-end delay in ZBLE is minimal because it is the most energy efficient way to avoid delays in packet transmission through multiple routes.

3. Energy Consumption

Energy consumption refers to the amount of energy spent by the network node during the simulation time. This level of the energy level of each node is achieved by factoring at the end of the simulation, the initial energy of each.

Fig.6 Comparison of Energy Consumption shows the graph. ZBLE Zone-based Topology, AODV, and AOMDV have shown variation in energy consumption. It rises in ZBLE because it is designed to choose from the highest energy levels and the source of the smallest energy level from the source.

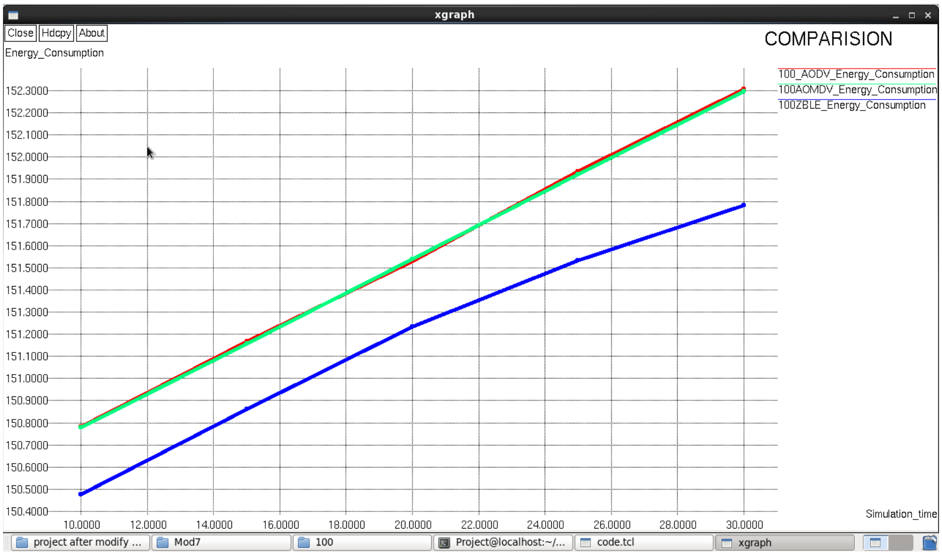

Fig.6. Graph of energy consumption with simulation time

ZBLE consume minimal energy because it contains information about most energy efficient paths. This sends the data packet to the highest energy and from the minimum source to the distance of the destination. In addition, it provides road transit facility in case of failure of any route.

4. Network Lifetime

Network lifetime refers to the time required to exhaust the battery of N mobile nodes.

Fig. 7 demonstrates the comparison of the lifetime of the simulation network. In this figure, the x axis shows the simulation time and when the Y axis timer changes time, then the number of nodes for the ZBLE, AODV and AOMDV indicates the exhaustion. ZBLE increases the life of its network as it routes traffic to high energy nodes in the network. In case, when the energy of these nodes is exhausted, topology has the property to gather information about various energy efficient routes and hence it transfers traffic on the shortest route for the next energy efficient, thus network Enhances life.

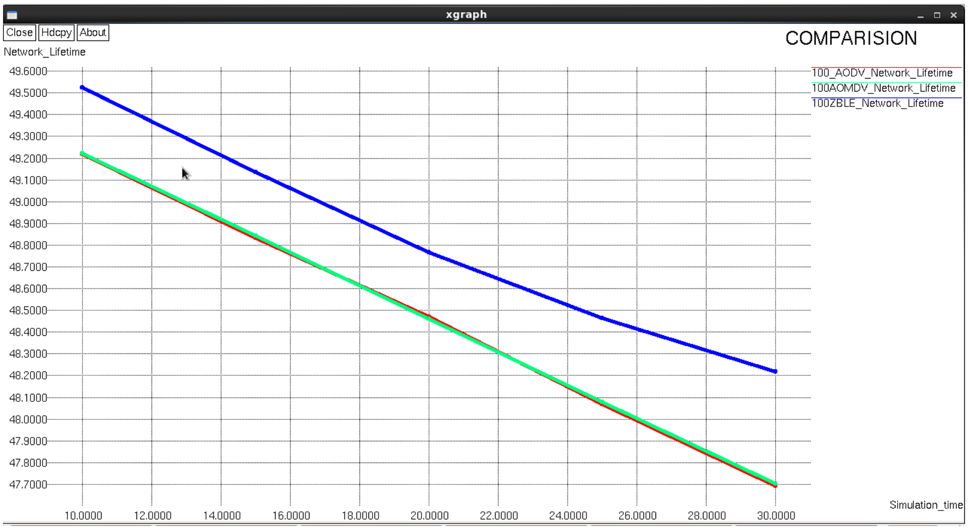

Fig.7. Graph of network lifetime with simulation time

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.

Table 2. Comparison of PDR

Simulation Time in Second	**Packet delivery ratio (PDR)**		
	AODV	**AOMDV**	**ZBLE**
10	56.3163	45.5414	89.0665
15	52.8433	42.4411	93.5023
20	69.413	46.0608	93.988
25	57.9648	46.0278	96.0229
30	62.4235	44.1706	95.9624

Table 3. Comparison of Throughput

Simulation Time in Second	**Throughput**		
	AODV	**AOMDV**	**ZBLE**
10	10 150.52	10 121.72	10 245.00
15	15 216.20	15 173.64	15 371.55
20	20 382.47	20 253.80	20 490.15
25	25 401.62	25 31 8.92	25 619.96
30	30 521.08	30 368.71	30 738.42

Table 4. Comparison of End To End Delay

Simulation Time in Second	End To End Delay		
	AODV	AOMDV	ZBLE
10	579.79	1061.11	256.695
15	940.768	1079.9	87.9443
20	662.81	1008.82	177.819
25	535.12	1182.67	68.5571
30	588.861	1389.71	47.868

Table 5. Comparison of Energy Consumption

Simulation Time in Second	Total energy consumption		
	AODV	AOMDV	ZBLE
10	150.781	150.778	150.475
15	151.168	151.157	150.863
20	151.529	151.539	151.233
25	151.933	151.921	151.534
30	152.308	152.297	151.781

Table 6. Comparison of Network lifetime

Simulation Time in Second	Network lifetime		
	AODV	AOMDV	ZBLE
10	49.2187	49.2223	49.5255
15	48.8319	48.843	49.137
20	48.4706	48.4612	48.767
25	48.0674	48.0788	48.4656
30	47.6918	47.7026	48.2193

6. Conclusions

In this research, we propose ZBLE (Zone Based Leader Selection Energy Constrained AOMDV Routing Protocol), a protocol based on Zone Technology, which has been simulated using various simulation times using NS-2.35. These scenarios are tested by 5 performance matrix packet delivery ratios, throughput, end-to-end-delay, energy consumption and network lifetime. The results of simulations have proved that the proposed ZBLE protocol has delivered better results than modern two protocols AODV and AOMDV. This is an amazing activity to help ZBLE's help to maximize the life of the network.

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