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NODE LIFETIME INCREMENT USING ENERGY PROTOCOL IN MOBILE AD HOC NETWORKS

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ABSTRACT

Wireless Ad hoc networks have become a centre of research interest over the last few years due to the promise of being self-configurable networks. One critical issue for almost all kinds of portable devices supported by battery power is energy conservation. Without power, any mobile device will become useless. This proposed work discusses new energy model that prolongs the lifetime of mobile nodes in MANETs. In this major role functionality is carried out using Energy AODV protocol. There are two main ideas of energy saving routing algorithm for Ad hoc routing protocols: The first one is to send each packet with minimum energy consumption. The second is to maximize the network lifetime as much as possible. According to energy as usual may not be right path, which ensuring power consumption case. so new mechanism which is going to be attain the objective of this proposed work.

Index Terms— *AODV, Energy Consumption, MANETs.*

1. INTRODUCTION

An ad-hoc wireless network is a collection of nodes that come together to dynamically create a network, with no fixed infrastructure or centralized administration [1]. For a source to send data packets to a destination that is not in its direct range of transmission, the packets must be relayed through one or more intermediate nodes [2]. All devices in Mobile ad hoc networks are limited by the capacity of the battery-power. To save the energy of nodes as much as possible and to maximize the total battery life of the mobile node in [3] that the new protocol has be to designed.

The two main ideas of energy-saving routing algorithms for ad hoc routing protocols [5]. The first one is to send each packet with minimum energy-consuming. The second is to maximize the network lifetime as much as possible. These two ideas are considered relatively independent of one another, the intention is to combine these two ideas, to maximize the network's lifetime. This work intends behind the a new energy model, which will ensure that all the nodes are balanced in their energy consumption and too prolong the network's lifetime [6].

When the application like the energy in MANET is an more importance is considered in emergency rescue, military operations, business meetings the other situations.

The idea of algorithm of Energy-Based Models of Routing Algorithm and section 1is present the Introduction, relate works are discussed in section 2. The proposed work described in section 3. The simulation model is presented in section 4. The conclusion is discussed in section.5

2. RELATED WORK

Ad hoc networks can be used as a directed graph diagram G = (V, E) to describe, where V is the set of nodes, E is a direct communication between nodes (Within each other's communication range) in the link collection, |V|=N, and |E|=M. In traditional communication networks, nodes u and v of the edge (u, v) can use hop count, link capacity and represent the load current, but here represent the level of energy consumption [7].According to the signal transmission model, l, using d −n to denote received signal power, and d denotes two nodes communicating with each other between the transmission distance .Generally n=2 denotes the transmission distance between two nodes are closer ,and n = 4 denotes the transmission distance is far.[8] The following formula is used to calculate the transmission of power: Where ε positive number, $S_{u,v}$ is the Current link (u,v) between the channel and interference, $d_{u,v}$ is the distance between u and v, and n has taken 2 or 4. In this model, the relevant parameters are simplified to obtain the following formula:

$$P_{u,v} = Kd^{\alpha}_{u,v}$$

Where K is a Positive Number, α still takes 2 or 4 and $d_{u,v}$ Meaning as Above. To define a directed graph $G_s = (V\ E_s)$, where G is a subset, use $P_t(v)$ to represent a node v in t period of residual energy, to simplified the facilitate, omitted parameters t, use P(v) to describe it. Set the initial energy of node v to E(v) ,when a node V_j in V_i is within transmission range ,also v_i uses $P_i(v)$ towards j v sending the data packers, in G_s, v_j and i v the directly connected edge. Therefore if becomes apparent that, $\| E \| \leq M_s$, $E \subseteq E_s$. Use P(u) to denote u in t period of residual energy, due to the factor v and u are directly adjacent nodes. Node u is the proportion of residual energy (energy consumption rate) as follows:

$$P_{u,v} = \frac{\varepsilon \| d_{u,v} \|^{n}}{S_{u,v}}$$

In G_s diagraph, set P as directed link (v_0, v_1) (v_1, v_2). . . (v_{l-1}, v_l) connected among the path, v_0 is the source node v_l is the destination node.

$$Kd_{vi,v1+i}^{\alpha},\ \theta(u) = \frac{P(v_i)-Kd_{vi,v1+i}^{\alpha}}{E(v_i)}$$

Hence, to get the Optimal Routing from v0 to vl that the following two conditions must fulfilled:

a) Make path P of transport energy consumption lowest, approach as follows formula:

$$W(P)\ MIN(\Sigma^{l-1}_{i=0} Kd_{vi,v1+i}^{\alpha})$$

b) Ensure all the nodes in path P, such as vi, to maximize the minimum rate of energy consumption. This is to ensure that all the nodes, and then makes the network the longest life time.

3. PROPOSED ENERGY BASED MODELS FOR ROUTING ALGORITHM

The objective is to devise an efficient routing algorithm for finding a routing path that minimizes the total transmission energy consumption and maximizes the minimum residual energy capacity of any node in the path [9]. From this analysis it can be seen that the problem is a NP-Hard problem. construct an approximate routing algorithm to ensure a second-best solution [10].

Energy AODV

In directed graph Gs, Each edge (link) (vi, vi+1), set double weights as follows:

$$\theta(u) = \frac{P(u)-Kd_{u,v}^{\alpha}}{E(u)}$$

The first of these weights is expressed as the node transmission energy consumption. The second weight is expressed as the lifetime of the corresponding node. To ensure that every node of the network is uniform in its energy consumption, on the various paths, the total energy consumption is set to a lower limit. BL, β>1 (positive number) L for a minimum number of hops on the path, and Fv (θ) represent the maximum energy consumption from the source to the destination. Moreover, setting a threshold θ, each node of energy consumption rate < θ 0 <θ < 1.To ensure that the excessive energy consumption of some nodes.

This Algorithm model can be achieved as follows based on above conditions is as follows objective function

Among them, node Vi and Vj directly connected, Vi use P(Vi) power to send packets to neighbor nodes. In order to describe the algorithm and proposed model, the details representation is given in figure 1. Assume S as a source node, D as a destination node the principle approximation algorithm. if θ = 0.3.

$$F_{vj}(\theta) = MIN\{ F_{vj}(\theta) - Kd_{i,j}^{\alpha} \}$$

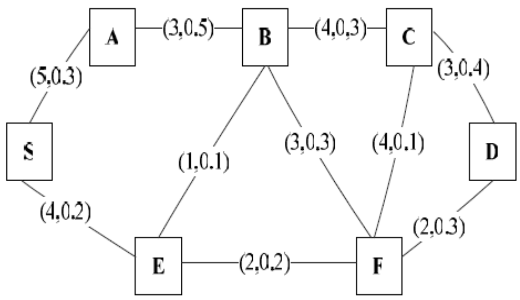

Figure.1 the example of Approximation

Constraint condition:

(1) $$\frac{P(v_i)-Kd_{i,j}^{\alpha}}{E(v_i)} \geq \theta$$

(2) $F_s(\theta) = 0$

(3) $D(\theta)\ F \leq \beta L$

Step 1: Fs (θ) = 0 As can be seen form figure.1 the adjacent node of S is A and E, the energy consumption S→A = 5 then S→E = 4 but as a result of θ ≥ 0.3, FA > FE, RREQ can only send to node A;

Step 2: In the same way, the energy consumption S→A→B is FB = FA+3=8, in addition satisfying at the same time $\theta \geq 0.3$

Step 3: The adjacent of the node B is C and F ,the energy consumption of S→A→B→C is Fc= FB +4=12, while FF=FB +3=11, At the same time nodes C and F satisfy $\theta \geq 0.3$ therefore RREQ respectively sent to nodes F and C

Step 4: F and C, D, and E, are directly connected. From F to E, C is $\theta < 0.3$, RREQ don't send to E and C, just sends to D, FD' = FF+2 =13 $\theta \geq 0.3$, and RREQ initiate form node F to the destination (node) D

Step 5: Node C is directly connected to D, and F, due to F being equal to $\theta < 0.3$.We doesn't consider F, FD'' =FC +3=15, and at the same time guarantee $\theta \geq 0.3$.

Step 6: From source node S to the destination node D, two route paths are fulfilled: S→A→B→F→D and S→A→B→C→D. But the energy consumption of this route: S→A→B→F→D act as 13<15, so we choose this path as our best route, but these two paths have the same number of hops.

Given θ and β, a procedure FIND(Gs ,θ , β) will be used to check whether Gs contains a routing path for a request from S to D such that the total transmission energy consumption in the path is no more than βL and the load ratio of the network is no less than θ at the same time. That is, FIND (Gs, θ, β) finds such a solution that the above model is satisfied simultaneously, for a given $0 < \theta < 1$.Now we can provide the formal description of the algorithm.

Procedure

FIND (Gs, θ, β) is shown below:

FIND (Gs, θ, β)

/* Find a shortest path in Gs from S to D. L is the length of a
shortest path in Gs. In this algorithm, we consider the minimum transmission energy for the request path from S to
D.*/

If no related path exists

Then no routing path exists for the request exists.

Else /* find a routing path satisfying the condition concerning the model.*/

$F_s(\theta) \leftarrow 0$;

length_Path_Nodes [S] S;

for all v V-{S} do

$F_v(\theta) \leftarrow \infty$;

endfor

for i←1 to N-1 do

for each (u,v) Es do

elseif $\dfrac{P(v_i) - Kd_{i,j}^{\alpha}}{E(v_i)} \geq \theta$ && $F_u(\theta) \geq F_v(\theta)\, Kd_{u,v}^{\alpha}$

then $F_u(\theta) \geq F_v(\theta)\, Kd_{u,v}^{\alpha}$

length_Path_Nodes[u] v;

endif

endfor

endfor

elseif D (θ) F £ βL then return true;

Else return false;

endif

endif

The above algorithm, which is used by finding a short routing path with fixed θ .this used to maximizing the load ratio of the network and bounding the total transmission energy consumption in a routing path and βL that is presented below

find_Approximation_Path (Gs, ε)

min_level← ε; /* the minimum bound of θ*/

max_level← 1; /* the maximum bound of θ*/

while (Max_level Min_level >ε) do

$$\theta \leftarrow \frac{Max\_level + Min\_level}{2};$$

If FIND (Gs, θ, β) Then Min_level ←θ;

Else Max_level ← θ;

Endif

4. SIMULATION AND DISCUSSION

Though many simulation tools are available for wireless Ad-hoc networks, we have chosen Network Simualtor-2 (NS-2) [11] in particular NS-2.29.3, the proposed protocol .we evaluated (Energy AODV) routing protocols by comparing its performance with (AODV) Ad-hoc On-Demand Distance Vector protocol to obtain the minimum energy consumption and prolong network's lifetime. The generation of the scenarios was done using the setdest tool of ns-2. A square field of 500m×500m is taken where 25 nodes are randomly deployed, simulation time is 900s, and the maximum speeds for nodes is *15*m/s, with a total of *25* nodes. The Initial energy is respectively 10,20,30,40 joules, and the pause time is: 0, 20,120,600,900 seconds .The traffic sources are CBR (Constant Bit Rate), 512-byte as data packets, and the sending rate is 4 pktsaq/second. The use of CBR is for the purpose of a fair comparison. But since the bit rates vary, data packet traffic load will become unpredictable, which is a situation we do not want to happen. Experiments used to configure other parameters are as follows: Channel and Wireless model (two-ray ground reflection model), MAC layer use IEEE 802.11 of DCF (Distributed Coordination Function). The performance achieved by Energy AODV. The residual energy of the source node is identified, which is defined as the remaining energy of a node and considered as the metric to prove energy efficiency of our proposed protocol. We used this metric to show the impact of transmission power on energy reduction. Figure.2 and Figure.4 shows the different initial energy and total energy consumption, two protocols on total energy consumption and network lifetime of the network situation. The performance comparison of these two parameters is as follows: Energy consumption and network lifetime Figure.2 shows the significant reduction in energy consumption by using Energy AODV when compared with conventional AODV protocol; Energy AODV shows slightly smaller energy consumption. the protocol seems to find a suitable route , taking into account the energy consumption of each node , while also taking into account the energy consumption rate, it is possible to satisfy the above two factors under these circumstances to reduce the total energy consumption . Figure.3 represents the situation of nodes in the different residence times, Energy AODV protocol discuss less energy consumption than AODV. This is mainly due to the increase in residence time, as well as incorporating the energy-saving strategy, thereby reducing the excessive energy consumption of the node. The results from figure.4 explain the performance of energy saving clear by. The view of two aspects from different initial energy and residence times shows that the performance improvement of ENERGY AODV protocol is significantly increased from the AODV. So with other possible scenarios, rapid establishment of alternative routes and carry out other aspects of performance comparison is also considered in our future work.

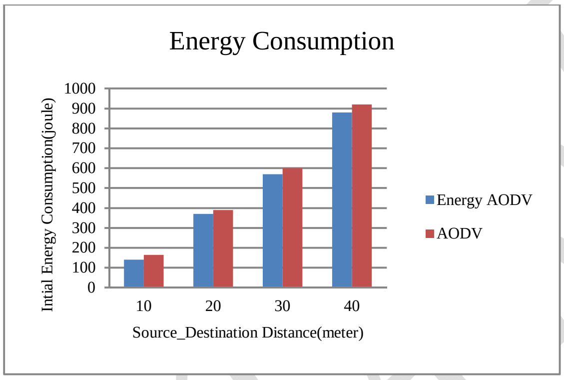

Figure. 2. among the mobile Total Energy Consumption vs Source_Destination Distance

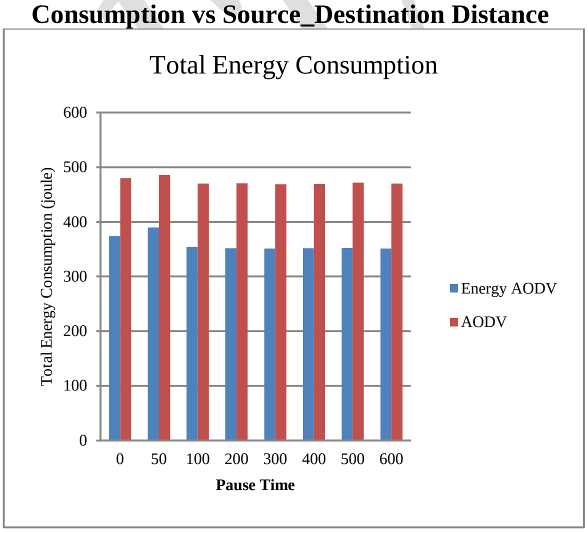

Figure. 3. Reduce the energy Consumption for Pause Time vs Total energy consumption

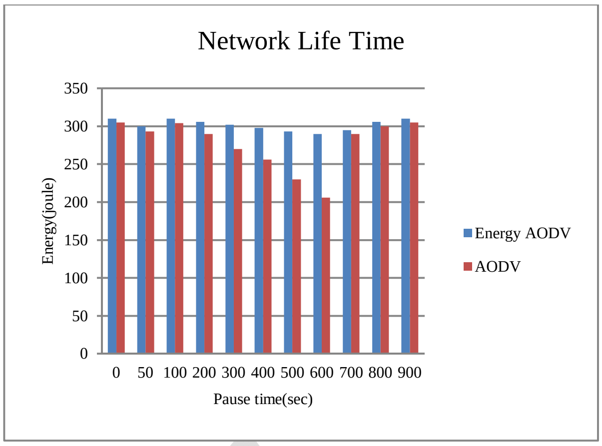

Figure. 4. Comparative analysis for network Life Time in Energy vs Pause Time

5. CONCLUSION

In this paper, Energy Ad on-demand routing protocols is minimize the energy consumption in during packet transmission as well as packet receiving time and also route discovery. It is obtain the dynamic energy distribution in the network, thus reaching the balance condition. We proposed a new energy consumption model (Energy ADOV) in wireless Ad-hoc Networks. It increase the node life time and minimizes network energy consumption compared to the traditional AODV protocols. In our future work we are planning to use. The energy lifetime increment is going to be carry out very large scale mobile ad hoc network

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