CRITICAL POWER MANAGEMENT IN AD-HOC WIRELESS NETWORK USING FUZZY LOGIC

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Abstract : The nodes in wireless Ad-hoc network having limited battery power inside operation field. The management of energy plays one of the important roles to sustain for long time in the network. To avoid termination of connection, battery power is so precious and must be utilized in efficient manner. The research deals with the process of managing power by controlling battery dissipation sources, scheduling them and increasing the lifetime of every route along with participating nodes. To increase the battery power of nodes three major means, require and that is efficient battery management, Transmission power management and System power management, which increases the overall lifetime of Ad-hoc network. Battery power management depends on their material and technologies used for making it different capacity. There are many techniques utilizes for scheduling of battery to increase the capacity of battery.

IndexTerms - Critical, Fuzzy Sets, Routing, Ad-hoc Network etc.

I. INTRODUCTION

A mobile node is highly active and distributed in nature therefore it requires more and more energy to sustain their functionality. As the nodes are powered by battery with limited capacity, where the source of power consumption in ad hoc wireless network may be different. The energy efficient routing indicates selecting routes which requires short distance with high energy. The improvement of the performance inside network could be possible through opting the best route in available remaining battery lifetime [1]. Since the factors impacting the route lifetime are unpredictable it cannot be derived systematically. Transmission power management deals with adaptation of optimum power level so that transmission of packet never breaks down [2]. System power management minimizes the power consumed by hardware equipment inside the node, it adopts low power consumption strategies inside protocols.

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II. RELATED WORK

There are two classes of conventions: one depends on the arrangement of data tables for example Expert dynamic or Table Driven routing conventions and the other is without them called Reactive or On Demand directing conventions[3].

2.1 Proactive or Table-Driven Routing Protocol:

These conventions endeavor to keep up steady, modern steering data from every hub to each other hub in the system [4]. Every hub keeps up at least one table to store steering data and react to changes in the system topology. Steering is persistently refreshed paying little respect to the system traffic.

2.1.1 Destination Sequenced Distance Vector Routing Protocol (DSDV):

DSDV convention [5, 6] has been explicitly focused for versatile systems. Each portable station needs to keep up a directing table, the no. of bounces to achieve the goal and the grouping no. relegated to the goal hub. The fundamental disadvantage of DSDV is that it requires a customary update of its steering tables, in this way diminishing the transfer speed effectiveness. It isn't reasonable for extremely huge system for example less versatility and it isn't likewise reasonable for exceptionally powerful system.

2.1.2 Wireless Routing Protocol (WRP):

WRP [7] has a place with the class of way discovering calculations. It keeps away from tally to interminability issue. Every hub in the system keeps up four tables: remove table, steering table, interface cost table and message retransmission list.

2.1.3 Cluster head Gateway Switch Routing Protocol (CGSR):

CGSR elects a node as a cluster head using a distributed algorithm within the cluster.

2.2 Reactive or on Demand Routing Protocol:

This kind of convention makes repetition just when wanted by the source hub. At the point when a hub requires a course to a goal, it starts a course revelation process inside the system.

2.2.1 Dynamic Source Routing Protocol

In DSR [8] the parcel contains the full course to goal and the middle of the road hubs don't need to settle on any directing choices. It isn't versatile to huge systems and even requires fundamentally more handling assets than different conventions. Essentially, In request to acquire the steering data, every hub must invest parcel of energy to process any control information it gets, regardless of whether it isn't the proposed beneficiary.

2.2.2 Ad Hoc on Demand Vector Routing Protocol (AODV)

AODV [9] depends on DSDV however it limits the no of required communicates by making courses on the interest premise. It communicates a course demand bundle to its neighbors, etc, until the goal is found. In AODV as the system estimate builds the exhibition measurements start to diminish. It is powerless against different sorts of assaults as it requires the collaboration of different hubs.

2.2.3 Temporarily Ordered Routing Algorithm (TORA)

TORA is exceedingly versatile circle free appropriated steering calculation dependent on the idea of connection inversion [10]. It is intended to limit response to topological changes. It ensures that all courses are without circle and ordinarily gives different courses to any source/destination pair. It depends on synchronized clocks among nodes in the ad hoc network.

III. PROPOSED WORK

The energy efficiency of node is defined as the ratio of amount of data delivered by node to the total energy expanded. Higher energy efficient implies that greater number of packets can be transmitted by the node with a given amount of energy reserve. These are few reasons for management of energy in Ad -hoc wireless network.

. The given protocol depends on interval-based membership function uses vague sets to evaluates energy efficient route. In the proposed protocol energy considered 100 joules and distance consider as 50 meters. The membership function for the input variable are described here in below table.

Table 1. Function of Energy

Linguistic Value	Base Value	Notation	Range
Low	(0,35)	El	[Ela,Elb]
Medium	(35,67)	Em	[Ema, Emb]
High	(67,100)	Eh	[Eha,Ehb]

Table 2. Function of distance

Linguistic Value	Base Value	Notation	Range
Near	(0,17)	Dn	[Dna, Dnb]
Medium	(17,34)	Dm	[Dma, Dmb]
Long	(34,50)	Dh	[Dha,Dhb]

A vague set f in a universe of discloser U could be given a true membership function αf and false membership function βf as follows:

$$\alpha f : U \rightarrow [0,1] \quad , \quad \beta f \rightarrow [0,1] \text{ and } \alpha f(u) + \beta f(u) \leq 1.$$

Thus the corresponding set $f_t = \{ f_1, f_2, f_3, f_4, f_5, f_6 \}$ where f_1, f_2, f_3 are element of first input and parameter and f_4, f_5, f_6 are element of second input parameter. The value of each element is given as:

f_1= (El ,(α(El), 1-β(E1))), $f_{2=}$ (Em,(α(Em), 1-β(Em))) , $f_{3=}$(Eh ,(α(Eh), 1-β(Eh)))

f_4=(Dn, (α(Dn), 1- β(Dn))), $f_{5=}$(Dm, (α(Dm), 1- β(Dm))), $f_{6=}$(Dh, (α(Dh), 1- β(Dh)))

Here each element having true membership is known as αf function and false membership function is denoted by βf .

α(El) ε [0, 17], β(El) ε [17, 35] ,α(Em) ε [35, 51] , β(Em) ε [51, 67], α(Eh) ε [67, 83.5] , β(Eh) ε [83.5, 100.0]

α(Dn) ε [0, 8.5], β(Dn) ε [8.5, 17] ,α(Dm) ε [17, 25.5] , β(Dm) ε [25.5, 34], α(Dh) ε [34, 42] , β(Dh) ε [42, 50]

For getting better ideal solution one have to discard false membership function β and select true membership function α.

After getting true membership function of both input parameters the fuzzy based implications could be set as below in Table 3. Comparison of different routes of MANET is calculated by the equation (1) below.

$$R_{ij} = \text{Mean of } \alpha(E_i) / \text{Mean of } \beta(D_j) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots.. (1)$$

Table 3: Implication for fuzzy route selection

Rules	Illumination
1	If (Energy is α(El)) and (Distance is α(Dh)) then (Rating of route is Rvb)
2	If (Energy is α(El)) and (Distance is α(Dm)) then (Rating of route is Rn)
3	If (Energy is α(El)) and (Distance is α(Dn)) then (Rating of route is Rs)
4	If (Energy is α(Em)) and (Distance is α(Dh)) then (Rating of route is Rm)
5	If (Energy is α(Em)) and (Distance is α(Dm)) then (Rating of route is Rlg)

6	If (Energy is α(Em)) and (Distance is α(Dn)) then (Rating of route is Rg)
7	If (Energy is α(Eh)) and (Distance is α(Dh)) then (Rating of route is Rvg)
8	If (Energy is α(Eh)) and (Distance is α(Dm)) then (Rating of route is Re)
9	If (Energy is α(Eh)) and (Distance is α(Dn)) then (Rating of route is Rve)

The rating of different route given in Table 4. Each Rij is a linguistic variable having different values which determine the nature of the route in MANET.

Table 4: Rating for different route

Route No.	Abbreviation	Illumination of rating	Rating of route
R1	Rvb	Very Bad	0.011842
R2	Rb	Bad	0.21176
R3	Rs	Satisfactory	0.105882
R4	Rm	Medium	0.059211
R5	Rlg	Less Good	0.105882
R6	Rg	Good	0.529412
R7	Rvg	Very Good	0.1
R8	Re	Excellent	0.178824
R9	Rve	Very Excellent	0.894118

Thus, each route has a specific rating in MANET. The sequence of different route based on following order R9>R8>R7>R6>R5 where the system selects R9 as highest optimal energy efficient route because it has higher energy and shortest distance and R5 is less good path but it could be considered as boundary of energy efficient route. Route R1 is the worst choice because it has lower energy.

IV. SIMULATION RESULTS

Based on the above proposed scheme the performance of protocol with respect to the throughput and packet loss are simulated using the NS2. Here the AODV, DSDV and DSR routing scheme have been taken for the comparison. To make the energy efficient routing using a vague set some changes are made in aodv.cc and aodv.h file, same things have been also done with DSDV and DSR.

Table 5: The Simulation Environment

Parameters	Value	Parameters	Value
NS-2 Simulation Version	NS-2.35	Receive energy	1.0
Topology Size	1000x1000	Idle energy	0.83
Mac Layer type	IEEE 802.11	Mobility Pause time	0 sec
Number of Nodes	12	Packet Size	512 bytes
Protocols under test	AODV, DSDV, DSR	Packet Interval	0.1 ms
Initial energy	1000 joules	Number of Source	1
Transmission energy	1.4	Number of Destination	1

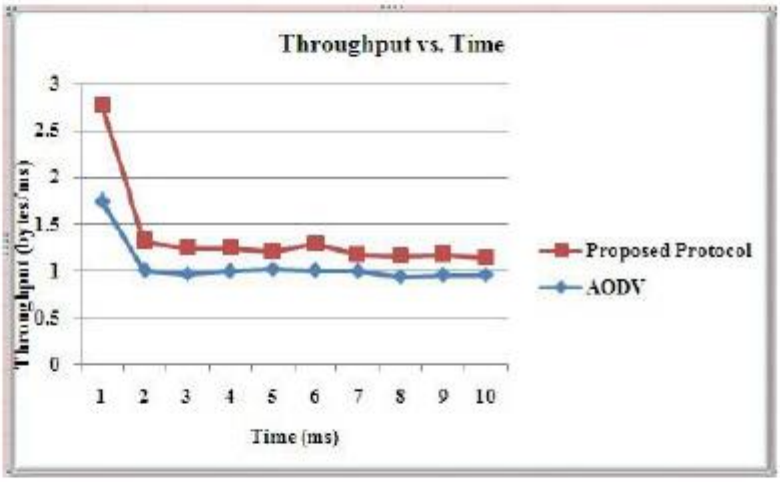

Figure 1. Throughput performance

V. CONCLUSION

In this paper, an exertion has been made to focus on the similar examination and execution investigation of different receptive/proactive directing conventions dependent on the presentation measurements. Proposed conspire is superior to AODV in course refreshing and upkeep process. It has been reasoned that because of the progressively changing topology and foundation less, decentralized attributes, security and power mindfulness is difficult to accomplish in versatile impromptu systems. Consequently, security and power mindfulness components ought to be worked in highlights for a wide range of utilization dependent on impromptu system. The focal point of the investigation is on these issues in our future research work and exertion will be made to propose an answer for directing in Ad Hoc systems by handling these center issues of secure and power mindful/vitality productive steering.

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