International Journal of Technology Research and Management
ISSN (Online): 2348-9006
Vol 6 Issue 2 February 2019

Power Aware Neighbour Coverage Based Probabilistic Routing Protocol for MANET

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Abstract: *MANET is a special case of ad-hoc wireless networks. Mobile nodes have small batteries with limited power. Large number of sensor nodes in MANET makes it impractical to replace sensor node batteries. Thus the life time of Mobile nodes is an important attribute of wireless ad-hoc networks. Proposed methodology present a novel alternate route selection based routing protocol for multipath energy efficient routing over MANET based on linear regression. In this dissertation tried to propose a very simple method, alternate route selection based routing protocol for multipath energy efficient routing over MANET based on linear regression. This approach helps to improve the network survival. We have compared our proposed method and experiment performed in NS 2 and result compared with existing and other reactive protocol. The simulation results also provide the better results as compare to previous approach. We have compared the result in three parameters ie packet delivery ratio, control packet overhead and Battery Power Consumption. Proposed method PNCPR has lower packet loss and lower control packet overhead, that trends higher packet delivery ratio and lower traffic as compared with existing method NCPR. Whereas towards Energy saving routing protocol proposed protocol try to move lower energy node towards less traffic and higher energy node towards high traffic and reduce retransmission whereas existing approach only minimized redundant path.*

Keywords: *Ad-hoc network, MANET, AODV, Routing Protocol, Energy Efficient Routing Protocol.*

1. INTRODUCTION

A Mobile Ad-Hoc Network (MANET) is an infrastructure less collection of mobile nodes that can arbitrarily change their geographic locations such that these networks have dynamic topologies which are composed of bandwidth constrained wireless links. To enable communication within a MANET, a routing protocol is required to establish routes between participating nodes [1-4]. Because of limited transmission range, multiple network hops may be needed to enable data communication between two nodes in the network. Since MANET is an infrastructure less network, each mobile node operates not only as a host but also as a router, forwarding packets for other mobile nodes in the network.

Mobile ad-hoc networks (MANETs) aim to provide wireless communication in a limited geographical area. Compared with traditional networks, MANETs have fundamental characteristics of open medium, dynamic topology, lack of central authorities, distributed cooperation, and constrained capabilities [11-18]. MANETs are especially attractive for use by the military, emergency service providers and commercial applications where user density is too spare or too temporary to justify the deployment of any infrastructure.

Mobile Ad Hoc Network (MANET) is a collection of two or more devices or nodes or terminals with wireless communications and networking capability that communicate with each other without the aid of any centralized administrator also the wireless nodes that can dynamically form a network to exchange information without using any existing fixed network infrastructure [5-9]. And it's an autonomous system in which mobile hosts connected by wireless links are free to be dynamically and sometime act as routers at the same time, and we discuss in this paper the distinct characteristics of traditional wired networks,

including network configuration may change at any time , there is no direction or limit the movement and so on, and thus needed a new optional path Agreement (Routing Protocol) to identify nodes for these actions communicate with each other path [7-9], An ideal choice way the agreement should not only be able to find the right path, and the Ad Hoc Network must be able to adapt to changing network of this type at any time. and we talk in details in this paper all the information of Mobile Ad Hoc Network which include the History of ad hoc, wireless ad hoc, wireless mobile approaches and types of mobile ad Hoc networks, and then we present more than 13 types of the routing Ad Hoc Networks protocols have been proposed. In this paper, the more representative of routing protocols, analysis of individual characteristics and advantages and disadvantages to collate and compare, and present the all applications or the Possible Service of Ad Hoc Networks. Wireless Sensor Networks (WSNs) consists of a set of sensor nodes that are deployed in a field and interconnected with a wireless communication network. Each of these scattered sensor nodes have the capabilities to collect data, fuse that data and route the data back to the sink/base station [10-15]. To collect data, each of these sensor nodes makes decision based on its observation of a part of the environment and on partial a-priori information [20-22]. As larger amount of sensors are deployed in harsher environment, it is important that the distributed computation should be robust and fault-tolerant. The identification of event in a wireless sensor network should be done as fast as possible, thus the computations are done in parallel.

2. PROPOSED METHODOLOGY

Image Proposed methodology extant a unique alternate route selection based routing protocol for energy efficient routing over MANET based on linear regression. Linear regression is used to check the energy consumed in packet transmission and reception and also used to select a path using neighbor nodes with higher residual energy.We are improving Neighbour Coverage Based Probabilistic Rebroadcast(NCPR) to Power Neighbour Coverage Based Probabilistic Rebroadcast (PNCPR). This tactic assistance to improve the network survival.

In this methodology, node S is source and node D is destination. Where node S sent packet to node D as shown in fig.1 Source S send packets to intermediate nodes which selects path and send packets to destination with a selected path. Here node C, node K, node L, and node M are intermediate nodes which are connected to each other with selected route.

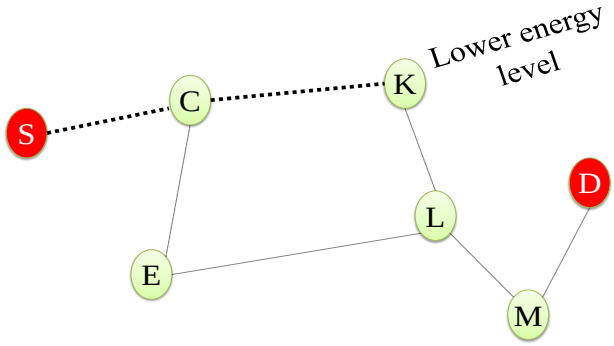

Figure 1: Packet sent from source to Destination

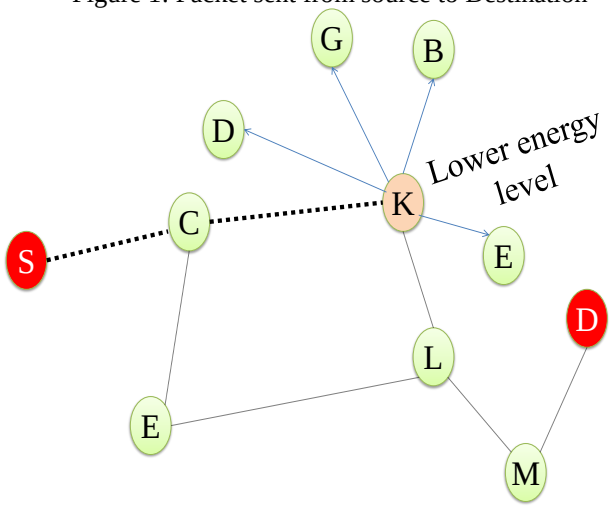

Figure 2: Energy Degraded Node

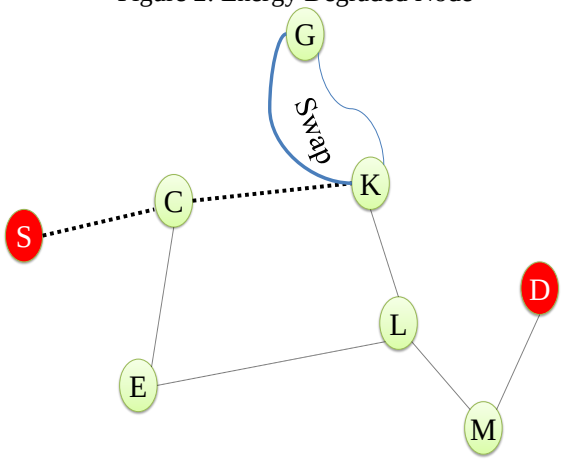

Figure 3: Node's Participate in Swapping

But energy of the node K drop below threshold, then it broadcast packet to its radio nodes as shown in figure 2. Then node K swaps with neighboring node and choose neighboring node having enough energy to transmit the packet as shown in figure 3 .The implemented protocol tries to migrate lower energy node towards less traffic and distribute higher energy node over heavy traffic section of network. Node is selected from low traffic area having higher residual energy limit to deliver supplement support to low energy node in high traffic zone.

3. PROPOSED ALGORITHM

The planned solution is working to deliver supplement backing to the high junction inferior energy node with inferior junction high-energy node. In proposed methodology, the node from little traffic area consuming middle resident dynamism limit is designated to deliver supplement upkeep low energy node at extraordinary traffic zone.

Assumption

S Node = Sender Node
D Node = Destination Node
N E = Energy of Node

Algo( )

S Node Call AODV for Broadcast Route Request Packet
{
If (Node exist in Range && Node Energy ≥ middle resident energy)
{
Match D Node ID to Self-Node ID
{
If (Not Match)
Intermediate Node forward Packet Header to Next Hop
Else
Receiver Found
}
Check all Available Path from Source Node to destination Node
}
// For Maximum Energy Path
{
If (Node Energy < Middle Resident Energy)
{

a. Lower Energy Node broadcast position replacement packet search node having higher node energy…
b. Each Neighbor node reply
c. Select node with maximum energy and lowest distance apart

}
Else
{
Node not found
}
}

If slightly node in network reduces their energy boundary underneath low resident energy node, formerly it broadcast node enhancement appeal to neighboring node. If slightly neighbor node is taking energy upstairs middle resident limit and resides in lower traffic region, it is selected for providing supplement support. Flow chart of proposed algorithm is also being illustrated in figure 3.5. Where if energy of any node is degraded below its middle resident limit then respective node broadcast .Replacement request to all their neighbor and by applying linear regression. Respected node chooses node with sufficient resident energy with minimum traffic load for supplement support.

4. SIMULATION DETAIL & RESULT ANALYSIS

The simulation of proposed method has been done in NS-2 with help of OTCL & TCL simulation script file, now evaluation of performance of these modified scheme we used standard parameter of ad-hoc network.

Packet delivery fraction: The ratio of the data packets delivered to the destinations to those generated by the traffic sources. Packet delivery ratio of total number of packets successfully delivered during data transmission to total number of packet send. For any ideal routing protocol it is required that it has higher packet delivery ratio as shown in equation 1and Proposed PNCPR have high packet delivery ratio as compared to NCPR as shown in given figures 5.

$$\mathbf{PDR} = \frac{\textit{Number of packet send} - \textit{Number of packet drop}}{\textit{Number of packet Send}} \mathbf{100} \quad \text{.....1}$$

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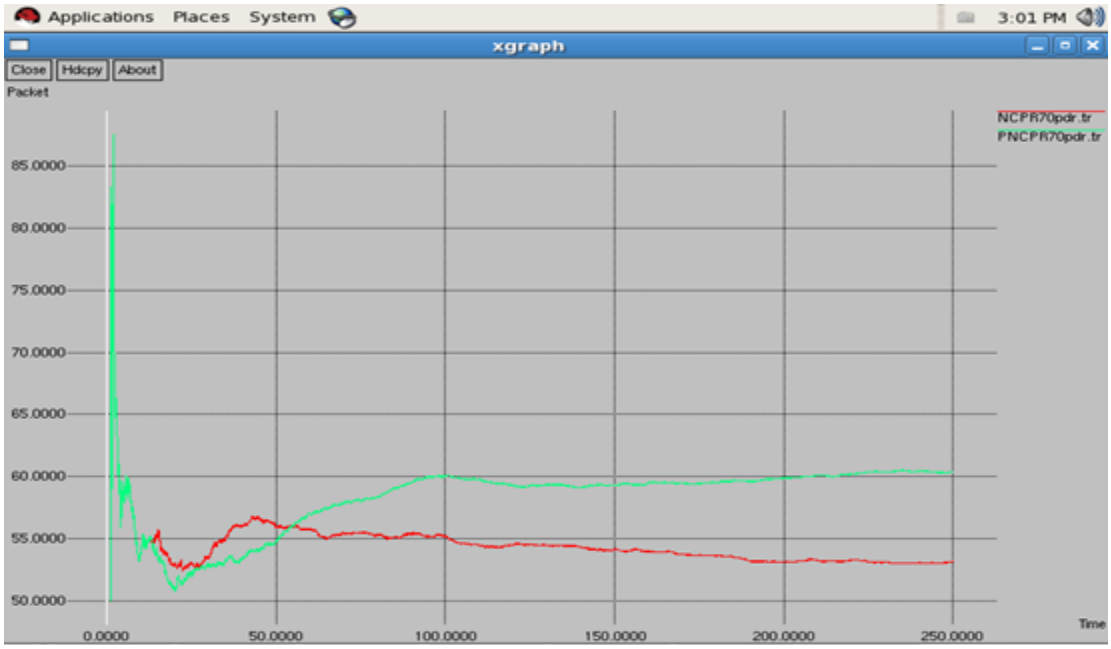

Figure 5: Packet Delivery Ratio

Routing Load: - Routing load is the overhead required to search route from source to destination and establish an end to end connection from source to destination. For any ideal routing protocol it is required that it has lower routing load as shown in equation 2.Proposed PNCPR have lower routing load as compared to NCPR as shown in given figures 6.

$$\textbf{\textit{Routing Load}} = \frac{\textit{Number of packet Send} - \textit{Number of data packet}}{\textit{Number of Packet send}} * \mathbf{100} \ldots\ldots\ldots\ldots 2$$

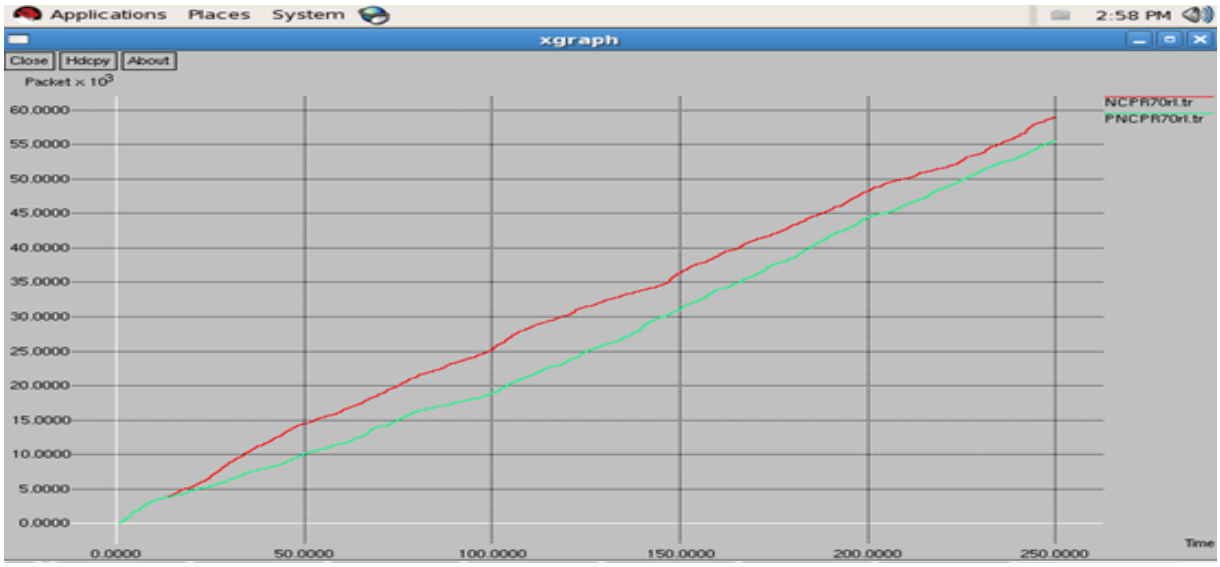

Figure 6: Routing Loa

Energy Consumption by Node: - Energy consumption means battery power used by any node for successful transmission. Higher energy consumption degrade the survival of network. And lower energy consumption maintains longer survival of network. For any ideal conduction network need longer survival as shown in equation 3.Proposed PNCPR have lower energy consumption as compared to NCPR as shown in given figures 7.

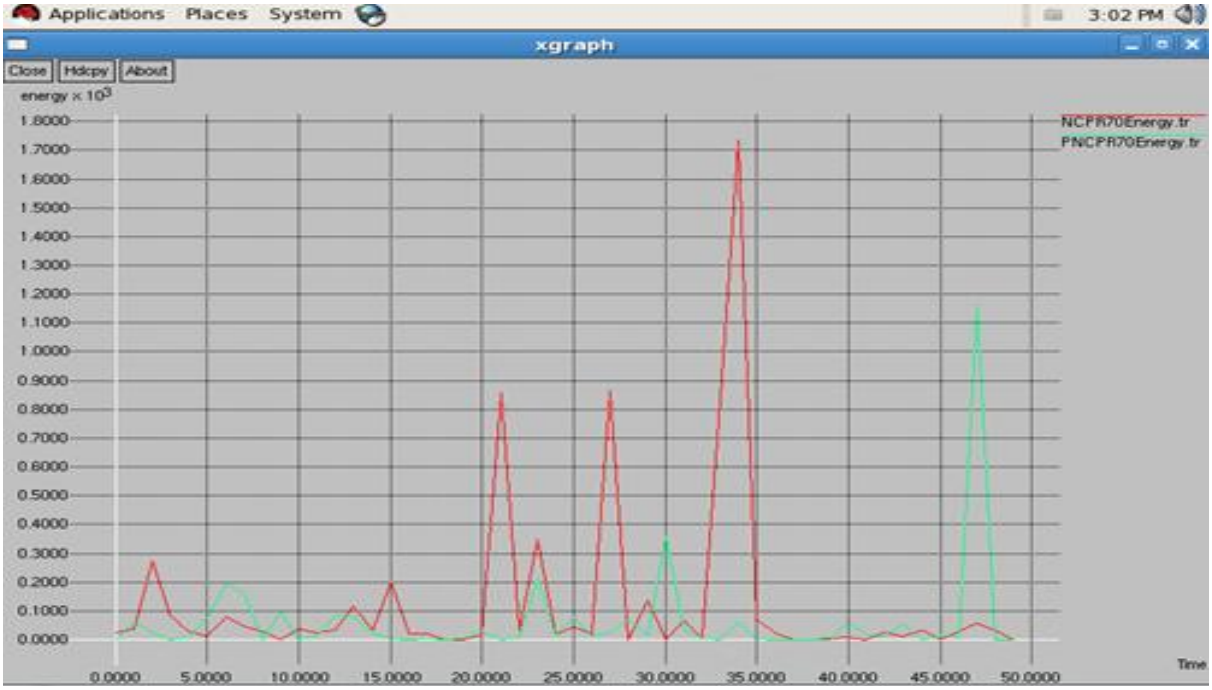

Figure.7: Energy consumption

$$\textit{Energy Consumption} = \sum_{i=1}^{n} \textit{Initial energy of node} - \sum_{i=1}^{n} \textit{Resident energy of Node}$$

Throughput: the fraction of the channel capacity for effective transmission (packets successfully delivered to the destination data) is given and is defined as the total number of packets received by the destination. It is in effect a measure of the efficiency of a routing protocol.In any sensor network it is required to have higher throughput ie need to increase rate of successful packet transmission. Average data rate of successful data or message delivery over a specific communications link. Network throughput is measured in bits per second as shown in equation 4.As shown in figure 8 the better performance of PNCPR in throughput as compared to NCPR.

Figure 8: Graph of Throughput in case of 80 nodes

$$= \frac{\textbf{\textit{Throughput}}}{\textbf{\textit{Sucessfull data transmission}}}{\textbf{\textit{Time}}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 4$$

5. CONCLUSION

This dissertation proposes the protocol for energy efficient routing over MANET. The Proposed protocol for multipath energy efficient routing over sensor network is presented. This method encapsulate advantage of two different predefine method in order to overcome their limitation. First one is alternate path and second one is clustering approach. Proposed protocol tries to migrate lower energy node towards lesser traffic and distribute higher energy node over heavy traffic section of network.

To improve the reliability through redundant paths in the network, it is suggested to have a maximum number of paths between the source and the destination. It is necessary to have a minimum number of nodes in each redundant path. Network reliability is increased in networks multipath disjoint nodes, where each node disjoint path has a maximum number of redundant paths and the minimum number of nodes in each redundant path. In the multi-path network node disjoint, the reliability is very high. The performance of proposed technique is depending upon network density and network traffic.

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