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Improving MANET Performance Using Self Adjustment Property and Unique Packet Transmission

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Abstract: In recent days wireless devices gets prominent role for transmitting data, Mobile Adhoc Network is a kind of wireless Network can be formed without any infrastructure. This type of devices are used widely in different applications like disaster relief, emergency situations etc. Multicasting of packets in MANET from one does to other nodes is a critical task, because while multicasting of packets to other nodes get more possibilities duplication packets. This causes reduction in performance factors in MANET. Also, due to natural characteristics of MANET, link failure is also a major reason for decreasing the performance of MANET. This paper concentrates to improve the performance of MANET by introducing the Self adjustment property and unique packet transmission. Self Adjustment property is implemented to reviewing the signal strength of the neighbouring nodes and adjust the location of node when gets less signal which leads the link failure.Unique packet transmission is achieved by checking the packet life time and transmit the packet only once. This proposed work was simulated using Network simulation and performance of MANET was compared with normal packet transmission, results proved that the proposed work was improved the MANET perofmance in all aspects.

Key words: MANET · Self Adjustment Property · Multicasting · Unique Packet Transmission · Battery Power Consumption · Duplicate Packet · link failure prevention

INTRODUCTION

Mobile Adhoc Network (MANET) is a kind of wireless Network technology used to implement a network with out need of any infrastructure as wellas no access point for transmitting of packets between source to destination [1]. It also called infrastructure network. Since it does not require any access point for transmitting of packets from one node to another node.This type of wireless networks are widely used in any emergency situation like disaster relief, earth quake, network failure due to natural disaster etc.

The MANET is working under the principles of receiving and transmittin of packets, Every node has own receiver and transmitter, whenever a packets received by the node, it put in to processing of packets address. If the address of the packets is intended the node, it does not transmit the packet to next hope. Otherwise the packet is forwarded to the next hope.This sequential forwarding technique process helps to transmitting the packets reached to the destination.

Routing protocols of MANET [2] plays an important role of role of transmitting of packets from source node to destination node. There are two major classification of protocols like proactive and reactive plays an routing process. Proactive protocols are routing protocols forms a route table where the route information from source to all other destination are maintained. DSR, DSDV [3] Protocol is an example of this proactive route table.

Another classification of protocol is reactive protocol, whih generate a route information, whenever the node wants to transmit the packet to the destination. AODV protocol [4] is an example of this routing protocol.

The key challenges of MANET is t change the network topology and limitation of battery power. Many research work is being involved to improve the batter power and link failure in the MANET. This research paper proposed two technique to improve te battery power and reduce the link failure.

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To improve the battery power all the devices involve in the processing of packets and check, whether the packet already is transmitted or not. If the packet is already transmitted, then the node decide to not forward the packet to the next hop, other wise forward the packet to the next hop. This technique will support the MANET to reduce the transmitting power, which helps to reduce the battery power usage.

Second proposed technique is reduce the link failure, this can be achieved by introducing the Self Adjustment property in MANET. In this Propoerty, nodes check the signal strength of the receiving packet, if the signal strength is get low, which causes the link failure.Immediately node calculate the neighbouring node location and adjust it location, so that to get good signal and also avoid the link failures.

This features are designed in MANET when transmitting of packet through Multicasting [5] communication.

This research paper is organized in section 2 depict the literature survey, section 3 elaborate research methodologies, following by the section 4 results and chapter 5 summaries Conclusion and Future work.

Literature Review: ARUNA A KADAM and S.A.JAIN, [6]. In this paper authors were find the problem that due to conjuction control link failure cause major role in MANET. The packet loss problem was solved by applying ACO and proved that there were improvement in MANET performance.

Authors Charu Gupta and Pankaj Sharma, [7] Proposed an algorithm which find the local route repair and execute the local repair. Results proved that better and improved efficient routing in AODV protocol.

In this paper, Authors Jyoti Upadhyaya, Nitin Manjhi, [8] were find out the novel routing metric which over come the routing link failure and also introduced the energy based routing finally they proved that there were performance improvement in MANET.

Here Authors K. Hanumanthu Naik, Dr.V.Raghunatha Reddy [9] proposed flooding technique minimization in AODV protocol and proved performance improvement in MANET. Also introduced check point route recovery algorithm (CPRRA) node which reduce the link failure.

In this paper, authors Vibhor Kumar Goal, Rishabh Shrivastava and Vivek Malik, [10] introduced improved routing protocol which help to improve the performance of MANET link failure.

Authors Sedrati Maamar and Benyahia Abderezzak, [11] were proposed a mechanism to detect the link failure based on signal strength which improves the QoS in MANET.

In this paper, authors Supriya Pandey, Pratibha Devi Umesh, [12] were proposed a threshold value to set on packet delivery ration and also find out the balck hole link and detect the link failure in MANET. This work was excuted in DSR ptotocol and shown the improvement in performance of MANET.

Authors of this paper Sakthi Saranya, G. Ravi, [13] were introduced variable transmission power, power aware routing protocol and power management technique to improve the performance in MANET physical, network and MAC layers.

In this paper, authors Anmol S. Suryavanshi, Nitesh Rastogi [14] were proposed different mobile node services in MANET. When one node find moves away from link, another node find the link between the link break node. Node dead due to energy collapse and Node going out of the radio range of its adjacent node

Authors of this paper Md Shahid Akhter, Vijay Prakash Singh [15] were proposed technique to increase the lifetime of the Dynamic Source Routing(DSR) protocol. This proposed algorithm increase the energy of the nodes and proved that amazing improvement in MANET.

In this paper Authors A.Parvathavarthini, S.S.Dhenakaran, proposed [16] were omplement the power aware On Demand–driven reactive Protocols in MANET.selection of node in energy efficient route based transmission which results that increase the residucal energy level.

The above research papers discussed the different techniques involed in link failure detection and battery power improvement.

Research Methodology: From the literature review, all the mentioned papers focuses link failure and battery power improvement in MANET. All the research works was dealt that link failure identification and power improvement, none of the technique deals with link failure prevention and battery saving using elimination of duplication packets with dealing out of packet details. This research paper introduce an algorithm is called Self Adjustment property algorithm to prevent the link failure in MANET. Second mechanism is introduced in this paper, eliminating duplication packet transmission which is achieved by monitoring the packet lifetime and other parameters of the packet to eliminate the duplication packet transmission. This improved the battery power. This proposed work is planned to implement in Network simulator and designed to compare the performance of the MANET.

Self Adjustment Property: In this section the brief discussion about the Self Adjustment property is proved with the algorithm, calculation involved for neighboring node identification and processing done by the node to adjust the location.

Self Adjustment Property Algorithm:
Node (n1,n2,n3,….n_n)

Source node S, Destination Node D

Steps

1. Source node S sends RREQ to all other nodes in a group want to multicasting of packets.
2. Receives the Route Reply from multicasing gropu nodes.
   (Route responds and Route Acknowledgement)
3. Source multicast the packet to the group.
4. Each intermediate node in the group does the following
   (i) Receive the packets and forward the packet to the next hop if it is not a intendent receiver.
   (ii) Packet received with low signal strength
   Calculate the neighbour node distance
   Calculate the neighbour node signal strength
   Calculate the adjusting lication to receive the good signal
   (iii) Find out the new location and adjust the location and go to step 4(i).

Receiving Node Signal Strength Is Calculated with the Help of Signal Calculation:
l- length of the neighbour node

P Power of node

Pr(l) – Received power length of node.
Pt ; transmitting power
Gt : Transmisison gain
Gr : receiver gain
L – path loss (should be 1.0)
Ht: height of transmission antenna (should be 1.5m)
Hr – height of recviver antenna (should be 1.5m)
Signal strength = $p_t * G_t * G_r * h_t^2 * h_r^2 / d^4 L$

Detecting Presence of Neighboring Node: Neighboring node is detected by sending Router request and Router reply calculation. Choose the all the nodes in the specified threshold distance is using the following equation.

where N is a group of neoghboring node and L is the
$L > \max[\log 2\ Tu]$
where uϵ N.

Calculate the Adjustment of Node to Prevent Link Failure: Upon receiving the signal strength and calculate the neighbouring node, the adjustment of the intermediate node distance is using

$d = m * \ln 2 / n(t)$
where n is neoghboring node count n(t)
m- distance maximum
l distance minimum
n number of nodes

Reduce the Battery Power of MANET: Another limitation in MANET is battery power, this research paper concentrate on reduce the battery power through the mechanism of packet processing Algorithm.

Packet Processing Algorithm:

Steps

1. Each node recive the packet
2. Extract the packet IP address and sequence number
3. Check the packet IP address and ssequence number in the send packet buffer
4. If (the packet is already send) then
   Drop the packet forwarding
   Else
   Place the IP address and sequence in Send Buffer

   Forward the packet to the next hop
   Goto step 1

   The average time of the packet to actively participate in receving and transmitting of packet on each node is
   Average Time = Σoperation time/ number of operational period

RESULTS AND DISCUSSION

In this section, the proposed work of the research is simulated in simulation using Network simulator NS3. Both the self adjustment property and packet processing algorithm is adopted with the ADOV [17] protocol, since the AODV is On Demand protocol find more suitable for performing the research work. Simulation Parameters [18] are shown in the Table 1.

TABLE 1 Simulation Parameter

Parameter	Value
Simulation Area defined	1000m * 1000 m
Number of nodes	100 to 200
Number of nodes are selected for Multicasting	50, 100, 150, 200
Average speed of nodes	0 – 20 meters / second
Mobility model	Random
Number of packets send	50
Transmission range of node	150 m``
Packet size	512 bits
Node becon interval	0.5 seconds
Constant bit rate	2 packet/ second
MAC protocol	802.11 DCF
Initail Energy	1000 joules
Antenna model	Omni Directional antenna
Simulation time	750 sec

The perofmence factors are calculated and compared with the AODV protocol. The proposed work is implemented with AODV [19] protocol and it was named as SAODV (Self Adjustemnt property AODV) for performance comparsion [20]. The paramenter are taken in to consideration for comparision are

- Thoughput
- End to End delay
- Packet Delivery Ratio
- Residual Energy
- Overhead

Throughput: Throughput can be defiend as number of packet able to transmit at a time by a node. This Throughput comparision is made with AODV [21] protocol with out self adjustment property. The simulation results shows that improvement in throughput in the aspect of 10% with ordinary AODV protocol shown in the Figure 1.

End to End Delay: End to End delay can be define as a period of time, each packet can be reside in a queue in each node. The End to End delay of the proposed work is lesser than the Existing AODV protocol [22] with 15% shown in the Figure 2.

Packet Delivery Ratio: Packet Delivery Ration is defined as number of packet can be delivered at a specific node in network. The number of packet delivered in each node is more than 10% in each node, before the link failure occur and after the aself adjustment on the nodes the packet delivery ration in double than the previous ration from 10% to 25% shown in the below Figure 3.

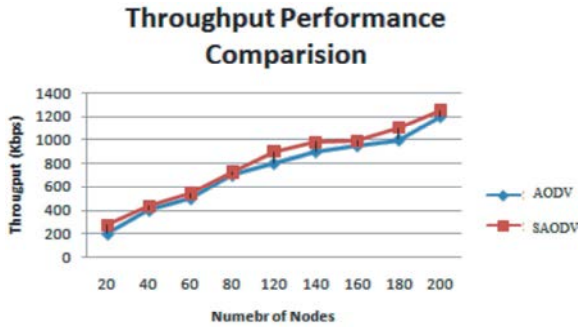

Fig. 1: ThroughPut between AODV and SAODV

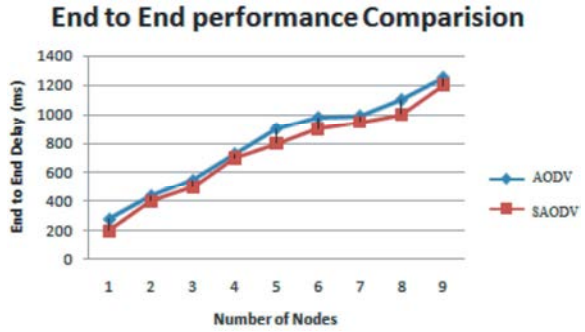

Fig. 2: End to End Delay

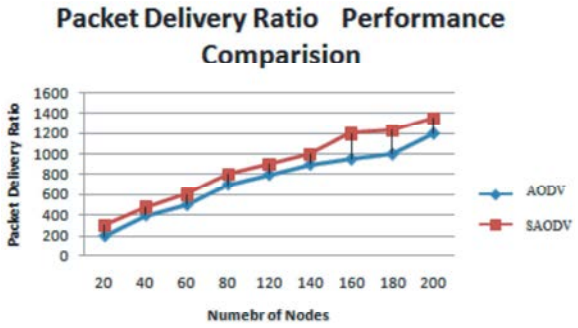

Fig. 3: Packet Delivery Ratio

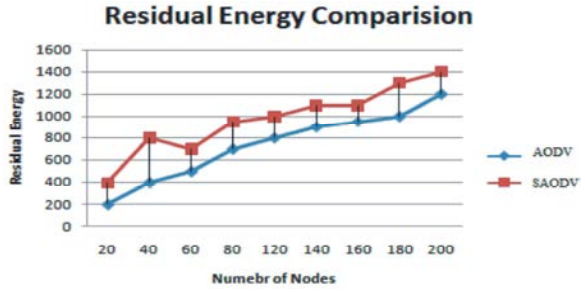

Fig. 4: Residual Energy

Residual Energy: The Residual energy can be defined as maximum energy a node will hold after transmission of packets. This Comparsion is done with AODV protocol and results showns that the proposed SAODV protocols hold maximum number of energy in range of 40%to 50% proved in the Figure 4 above.

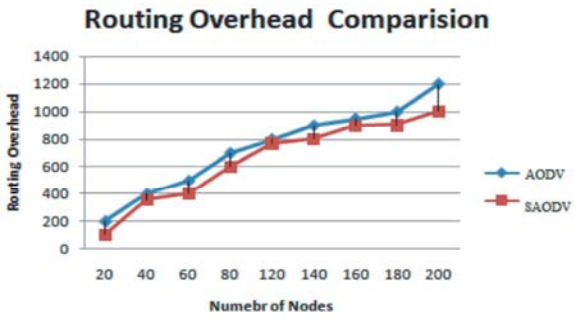

Fig. 5: Routing overhead

Routing Overhead: Routing overhead can be defined as number of generated and forwarded routing messages, the performance comparsion of routing overhead between AODV and SAODV reduces the routing overhead in 30% is ahown in the Figure 5.

Conclusion and Future work: MANET has been designed for communication between the nodes. Multicasting the Packet in MANET is a challenging issue and concentrating the characteristics of MANET like link failure and Battery Power utilization. This research article concentrate the above three factors and achieved the multicasting of packets in MANET, prevent the link failure, finally improved the better utilization of battery power. This research work was designed and simulated in Network simulator and performance factors are compared with the Existing AODV protocol, result proved that enormous improvement in MANET.

In future this research work can be enhanced in increasing the multicasting packets in more number of nodes.

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