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Analyzing the Effects of Hello Packets in AODV

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Abstract—A reactive protocol used for data transmission in Ad hoc networks is AODV .The data transmission in AODV is done in two phases: route finding and route preservation. As Ad hoc networks are multi hop wireless network which results in lot of link break and occurrence of packet drop. To overcome this problem, many algorithms are introduced like backup routing, local repair and route maintenance which are based on the broadcasting of hello packets for local link connectivity, but this flooding of hello packets after every one second results in unnecessary power utilization and bandwidth consumption . In this paper, we are going to explain the algorithm and their inadequacies. The result of simulation in NS 3.25 shows how the efficiency of protocol is enhanced when the broadcasting of hello packets is restricted.
Keywords—AODV, Hello Packet, PDR, Bandwidth

I. INTRODUCTION

The wireless networks are classified as structured and structureless. The IEEE 802.11 structured networks offers high bandwidth and are well suited for prearranged areas but structure less wireless networks are organized for temporary use, they are based on multi hop wireless nodes which can be maximized without much intrusion, the nodes are acting as transceiver, server and routers as well such networks are called Ad-hoc networks. Ad-Hoc network is a type of network application which is decentralized, multihop, non permanent, without any structure, it is set up by laptops, tablets, mobiles and other portable gadgets to make communication possible in case of battlefields, disasters and conferences. No doubt these networks are easy to deploy but side by side these networks have a lot of challenges like limited bandwidth, limited energy resources, security and network mobility(NEMO) and to keep track of the nodes so that their connectivity can be retained the nodes of the network are regularly monitored by the broadcasting of various control packets.

The reactive routing protocols of ad hoc network transmits hello packets to establish link connectivity between two peer of nodes, this mechanism works well in structured networks where packet loss is less and the handshaking between the nodes is performed, however when we employ this implementation in Ad hoc networks it increases the burden of the protocol and degrades its performance. In this paper we described a reactive routing protocol AODV(Ad hoc On Demand Vector) where routes are established only when they are demanded and the participating nodes originator, target and forwarding nodes keep record of the data transmission in the form of routing tables without effecting the other nodes of the network and once the transmission is over the route is marked as expired. Hello packets are also involved in the implementation to maintain the connectivity of the network. Other routines of route maintenance like backup routing and local repair for changing the neighbor table entries are also implemented to intensify the performance of the protocol .

In section II of this paper the working of AODV protocol of Ad hoc networks is covered, section III describes the hello messages, section IV shows the impact of hello message on the performance of protocols, section V demonstrates simulation results using PDR and bandwidth of nodes parameters with and without hello messages and in section VI, the conclusion and future scope of the research is projected.

II. AODV PROTOCOL

AODV is a reactive routing protocol of Ad hoc network which is descendant of DSDV protocol. In AODV routes are formed only when they are required. The working of AODV is divided in two phases Route finding and Route preservation. Route finding is used for the discovery of route where the originator node broadcast RREQ packet which contains source IP, source sequence number, destination IP, destination sequence number and broadcast ID. The RREQ packet is flooded on the network, the nodes of the network checks their routing table and those having route to target node or the target node itself unicast RREP packet back to the originator, If more than one RREP is received the node with lowest hop count is preferred for transmission and the nodes out of range drops the RREQ packet. Once route is established the transmission of data starts from originator to target but due to wireless nature of nodes the link breaks are very frequent which involves the second phase of AODV protocol route preservation where at regular interval the protocol monitors the connectivity of links of the participating nodes of data transmission .There are two methods to check link

connection link layer feedback or broadcasting of hello messages . Due to the overheads of hello messages described in next section the protocol by default acquire link layer feedback which is complex by nature.

The link break is detected when the preceding node of link break peer sends RERR packet along with all unreachable destinations towards the source. The preceding node checks for any backup route in the Neighbor Table or is it able to process local repair, if any of the possibility occurs it carry on transmission from that point otherwise the originator is is intimated for a fresh route discovery. The flow chart of existing AODV protocol is shown in Fig 1.

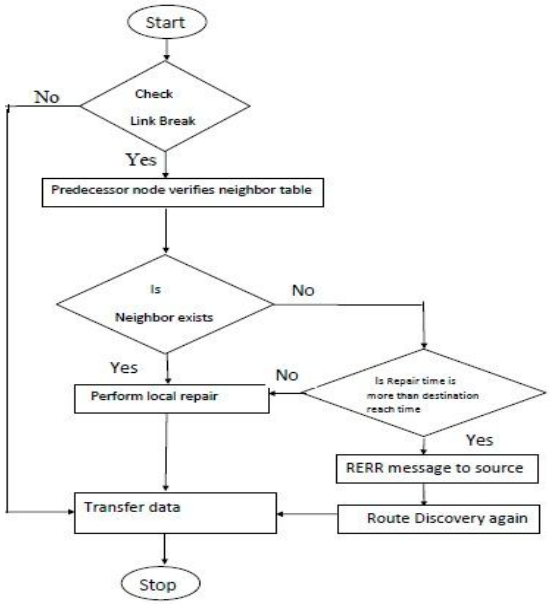

Figure 1

In Ad hoc network the two types of packets are floating data packet and control packet. Data packet is used to carry data from originator to target where as control packets are responsible for the smoothening of data flow. The connectivity of the network is the responsibility of control packet. In AODV we have four types of control packets RREQ, RREP, RERR and Hello. RREQ and RREP messages are casted in the route establishment phase of AODV protocol where as RERR is triggered on the occurrences of route break and the Hello messages are broad casted to check the presence of neighbor. On receiving hello message the node refers the routing table for the updation of routing table entry. A hello message is privately broad casted if node has not sent any data packet within a specified time interval to check the status of link the node sends hello packets and if the node fails to receive three consecutive hello packets the link failure is considered . This results the transmission of hello packets once per second which is overburdening the network.

By default HELLO packets are disabled in AODV protocol. In NS3.25 to activate the broadcasting of Hello packets, in the RREP packet where TTL is 1 can act as Hello message and some more fields of RREP are set as follows[6]:

Hop Count = 0

Destination IP = Node IP

Destination seq number = node's latest seq no

life Time = AllowedHelloLoss * HelloInterval

Hello packets consist of two attributes which are used to assume the connectivity of the network HELLOINTERVAL and ALLOWEDHELLOLOSS. HELLOINTERVAL is the number of milliseconds between successive transmission of hello packets [3] and ALLOWEDHELLOLOSS is the waiting time of maximum number of periods. HELLO-INTERVAL should wait before detecting the loss of connectivity to a neighbor. The suggested value of HELLOINTERVAL is one second [3] which shows the link break is detected if hello message is not received from neighbor within two seconds of the last message. Each node of the network keeps record of neighbor table for maintaining local connectivity about their neighbors. Whenever node receives hello message from its

neighbors, it verifies, the existence of route to that neighbor node in neighbor table, if route is found it updates route information by updating lifetime of that neighbors by HELLOINTERVAL *ALLOWEDHELLOLOSS [3] else node makes entry for that route in neighbor table, after making entry of that route current node can consider this route for forwarding data packets. Routes that are created by hello messages are not used by other active routes unless no link break occurs. In case of link break the preceding node checks the neighbor table if it found the node which can provide a path to the target then the local repair is performed otherwise RERR message is broad casted to the originator. RERR message is not generate by the routes that are created by hello messages if neighbor node is out of range or a neighbor timeout occurs. In-spite of maintaining the connectivity of the path, hello packets have some overheads also.

It results in routing overhead [4].

Hello messages drain batteries [5].

Improper updates of neighbor table information

III. OVERHEADS OF HELLO PACKETS

A. Routing Overhead

In data transmission participating node of the reactive protocol are continuously engaged in the transmission of either data or control packet. They are not only responsible for the establishment but for the preservation of the transmission path from the originator to target. This overhead not only utilizes network resources but also increases congestion in the network. The reactive routing protocols like AODV the possibility of link failure decides routing overhead. Regular broadcasting of hello packets results in the checking of the status of neighbor nodes for the preservation of the transmission path. This is the situation where a node repeatedly checks for the backup paths. This process not only increases the network overhead but also consumes energy.

B. Hello Messages Drain Battery

The most focused challenge in Ad hoc networks is battery life as all the nodes of the mobile Ad hoc networks are battery operated so it is very necessary for the effective transmission to consume less power, due to unnecessary battery drain the existence of the node is demolished from the network and the transmission of hello packets is one of the major cause of this. A lot of research is proposed to manage the power of the nodes of ad hoc networks. In [5] an adaptive hello interval is proposed to decrease battery drain through repression of needless Hello messaging. The paper [7] calculates RSS(receiving signal strength) value to control power in dynamic transmission to find reliable path of data transmission from source to destination where each node gathers it neighbor's RSS value and construct three transmission ranges(max, min, avg) alteration of transmission power depends on max transmission range.

C. Improper Updates of Neighbor Table Information

The reason of broadcasting of the hello packets is to create the neighbor table so that when route break exists in peer of transmitting node the backup route came into existence. At regular intervals backup routing is used as a way out in which neighbor tables are used to persist the data transfer but due to inadequate update of the neighbor tables so many shortcomings came into existence. In [1] the problem of route preservation due to improper working of hello packets transmission is discusses and an improved AODV routing protocol is proposed to deal with the problem of route maintenance. In [4] the rate of spreading of hello packet depends on the number of neighbor it has is described to check whether the broadcasting of hello packet is low or high in the network.

IV. SIMULATION RESULTS

The performance of existing AODV is analyzed in NS 3.25 with and without the broadcasting of hello messages and the result of two characteristics Packet Delivery Ratio (PDR) and Bandwidth are shown in fig 2 and fig 3 respectively. Our simulation environment has the following parameters and their initial values:

Parameter	*Value*
Region Area	300x1500 m
The transmit power	7.5 dBm.
Simulation Time	200 seconds
No of nodes	50
Mobility Model	RandomWaypointMobilityModel

Speed 20 m/s and no pause time

The WiFi is in ad hoc mode with a 2 Mb/s rate (802.11b) and a Friis loss model.

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To have non-visible rules on your frame, use the MSWord "Format" pull-down menu, select Text Box > Colors and Lines to choose No Fill and No Line.

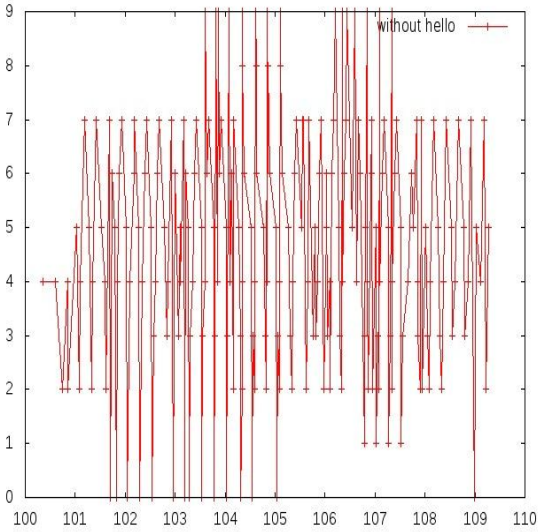

Figure 2

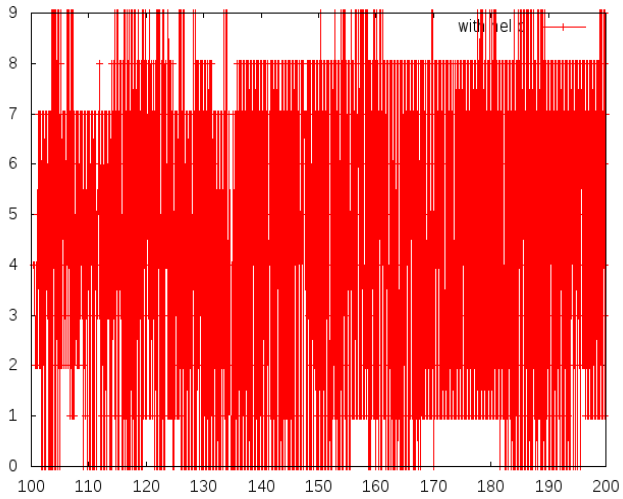

Figure 3

The result of Fig 2 where Packet Delivery Ratio (PDR) of nodes without hello packets are effective than with hello packets shown in Fig 3 because of the updation of routing tables at regular intervals whereas the bandwidth consumption of mobile nodes without broadcasting of hello packets is found lesser as compared to the broadcasting of hello packets which results in the disappearing of the node from the network.

V. CONCLUSION AND FUTURE SCOPE

In this paper, the AODV protocol is described in detail, the working of hello packets are analyzed in depth along with their overheads and their simulation shows both the pros and cons of the broad casted hello packets on the network.

The flooding of hello packets in structured wireless networks is worth proved whereas in case of Ad hoc networks after bearing the overheads for the maintenance of local connectivity of nodes so that local repair or fresh route discovery due to node mobility which results in link failure in the existing route can be performed requires improvements so that the reliability of the protocol raised.

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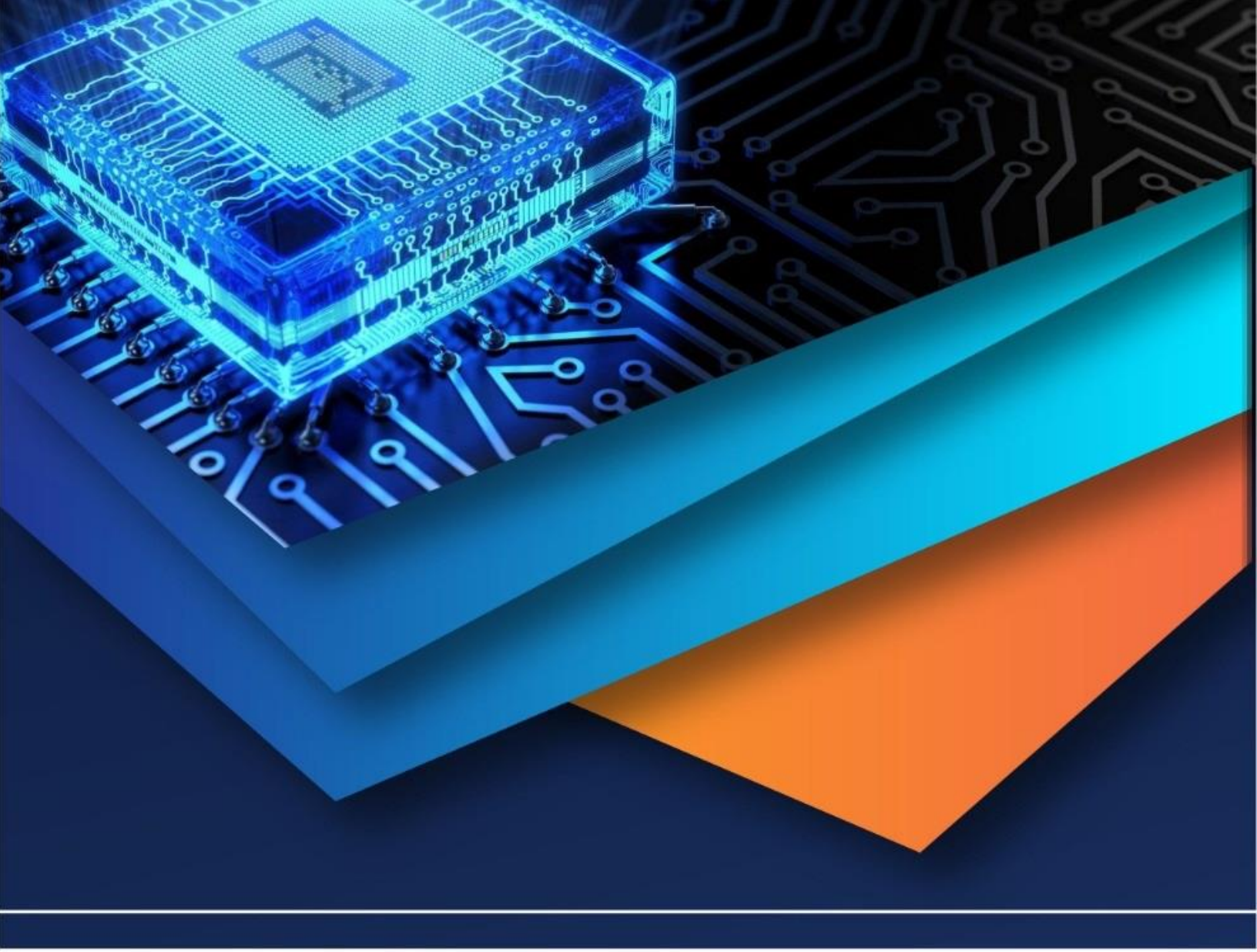

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