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A Review of Ad hoc on demand distance vector routing and proposed AR-AODV

Bhavana Gupta[1], Rajesh Tiwari[2], Vikas Jain[3]
[1]*Asst.Professor, Computer Science & Engg, CIST*
[2]*Asst.Professor, Computer Science & Engg, CIST*
[3]*Asst.Professor, Computer Science & Engg, CIST*

Abstract: Mobile Ad-hoc networks are a key in the evolution of wireless networks. In mobile ad hoc networks, there is no centralized infrastructure to monitor or allocate the resources used by the mobile nodes. The absence of any central coordinator makes the routing a complex one compared to cellular networks. The Ad hoc On Demand Distance Vector (AODV) routing algorithm is a routing protocol designed for ad hoc mobile devices. AODV uses an on demand approach for finding routes .A class of routing protocols called on-demand protocols has recently found attention because of their low routing overhead. The on-demand protocols depend on query floods to discover routes whenever a new route is needed. Such floods take up a substantial portion of network bandwidth. The routing in Mobile ad hoc network is difficult and number of reactive routing protocols like AODV, DSR, and DSDV has been implemented. In this paper, an attempt has been made to thoroughly study all AODVs and a new AODV is proposed called AR-AODV

Keywords: Mobile Ad hoc Network, Reactive, AODV, DSR, DSDV.

I. INTRODUCTION

A Mobile Ad hoc network consists of auto configuring node and these nodes communicate with each other via wireless equipment. Mobile nodes create a network on their own. Network topology change invariably and no condensed monitoring is there. Each node participating in the network can acts both as host and a router with willingness to forward packets for the others.

Routing protocol in Ad hoc networks has received wide interest in the past year due to the fact that existing internet routing protocol were designed to support fixed infrastructure and their properties are unsuitable for mobile ad hoc networks, the up to date standardized protocols are classified into three major categories based on the routing information update mechanism.

1. Proactive or table driven routing protocols: In this, each node maintains the network topology information in the form of routing tables by periodically exchanging routing information. Routing information is generally flooded in the whole network. Whenever a node needs a route to the destination it runs an appropriate path finding algorithm on the topology information it maintains.

2. Reactive or on demand routing protocols: Such protocols do not maintain the network topology information. They obtain the necessary route when it is required, by using a

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connection establishment process. Hence these protocols do not exchange routing information periodically.

3. Hybrid routing protocols: These protocols combine the best features of the above two categories. Nodes with a certain distance from the source node concerned or within a particular geographical region are said to be within the routing zone of the given node. For routing within this zone, a table-driven approach is used. For nodes located beyond this zone, an on-demand approach is used. We focus our study on on-demand routing protocols. Reactive protocols, such as DSR [1] and AODV [2], find route only when there is data to be transmitted and as a result, generate low control traffic and routing overhead. Proactive protocols on the other hand, find path in advance for all the source and destination pairs and periodically exchange topology information to maintain them.

1.1 AODV (Ad hoc on demand distance vector routing)

AODV is a reactive routing protocol that minimizes the number of broadcasts by creating routes on demand. Routes are discovered through a route discovery cycle, whereby the network nodes are queried in search of a route to the destination node. When a node with a route to the destination is discovered, that route is reported back to the source node that requested the route.

In this paper, we proposed modifications to AODV called AR-AODV works in case of when mobility increases and nodes are unreachable or traffic on that route occurs. The conservative nature of proposed protocol helps to find new routes in case of high mobility and network congestion, while at the same time maintaining good performance in application oriented metrics such as delay and varying network load. In the first part of work, survey is done on AODV. In the second part small modification is done in AODV Algorithm called AR-AODV.Section II provides a brief description of the analysis of existing AODV. Section III defines the Proposed Method. The Section IV concludes the paper.

II. RELATED WORK

To enhance the performance of routing protocols in MANET, a lot of approaches have been presented so far. The approaches can be mainly classified into two groups: Reliability based approaches efficiency and security based approaches.

Many Existing researchers proposed AODV using the concept of reliable distance, distance vector, source routing approach and link-disjoint multipath routing approach. Some rely on path accumulation during the route discovery process.

Perkins and Royer (1999) shown that AODV is based on a traditional distance vector routing mechanism, where the route is determined on a hop-by-hop basis [1]. The route is established by leaving a backward route to the source at intermediate nodes when propagating RREQ messages and by leaving a forward route to the destination at intermediate nodes when relaying the RREP message to the source.

Das et. al. (2001) compared performance of DSR and AODV, two prominent on-demand routing protocols for ad hoc networks [2]. Their performance comparisons are analyzed using varying network load, mobility and network size. They showed that the results DSR generates less routing load than AODV. In case of smaller number of nodes and lower load and/or mobility DSR performs better. And in case of more load and higher mobility AODV do better than DSR.

Mesut Gunes et. al. (2002) presented the approach that is based on swarm intelligence and especially on the ant colony optimization meta-heuristic. These fascinating families of algorithms try to apply the ability of swarms to mathematical problems and were applied successfully to several optimization problems in [3].

Gwalani and Belding-Royer (2003) presented a new approach of AODV-PA [4] incorporates path accumulation during the route discovery process in AODV to attain extra routing information. And it scales better in the large networks It is evident from the results that AODV-PA improves the performance of AODV under conditions of high load and moderate to high mobility. AODV-PA can be used either as an alternative to AODV or as an optimization under moderate to high load scenarios.

Chonggun Kim, Elmurod Talipov, and Byoungchul Ahn (2006) [5] propose a reverse AODV which tries multiple route replies. It reduces path fail correction messages and obtains better performance than the AODV. According to them Successful delivery of RREP messages are important in on-demand routing protocols for ad hoc networks. The loss of RREPs causes serious impairment on the routing performance. This is because the cost of a RREP is very high. If the RREP is lost, a large amount of route discovery effort will be wasted. Furthermore, the source node has to initiate another round of route discovery to establish a route to the destination.

Qiang and Hongbo (2008) propose an optimized AODV (OAODV) [6] using the concept of reliable distance which is always smaller than transmission range, is depended on the nodes velocity and direction information. The new protocol restricts the region of flooding RREQ in route discovery process. They show that by their mechanism the routes are more reliable. They had also compared the performance of their algorithm with existing AODV.

Zahary and Ayesh (2008) presented the concept of ORMAD [7] in which is a link-disjoint multipath routing approach in MANETs it tries to optimize routing overhead of both Route Discovery Process (RDP) and Route Maintenance Process (RMP) of multipath extension to AODV. When detecting a link failure in the primary route, ORMAD invokes a local repair procedure between the upstream and the downstream nodes of the broken link. For route efficiency and minimization of routing overhead it applies RMP to only efficient route.

III. PROPOSED METHOD

a. AR-AODV (Alternate Route Ad hoc on demand distance vector routing)

AR-AODV is a reactive routing protocol. The route discovery (Route Request and Route Reply) process of AR-AODV is similar to the AODV protocol. We slightly change the AODV protocol by establishing Alternate route feature in case of high mobility and traffic. Here we assume the nodes follows mesh topology.

(i) Creation of route: In the route discovery process sender node searches a route by flooding a RREQ packet. A middle node, upon receiving a non-duplicate RREQ, records the previous hop and the source node information in its route table. It then broadcasts the packet or sends back a Route Reply (RREP) packet to the source if it has a route to the destination.

Alternate route are established during the route reply phase. Because of the broadcast nature of Mobile Ad hoc network, a node constantly “overhears” packets that are transmitted by their neighboring nodes. From these packets, a node obtains temporary route information. When a node that is not part of the route overhears a RREP packet not directed to itself transmit by a neighbor it records that neighbor as the next hop to the destination in its **alternate route table.** A node may receive numerous RREPs for the same route if the node is within the radio propagation range of more than one intermediate node of the primary route. In this way the source node also selects the best route to send the packet to the destination.

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(ii) Maintain Route: Initially data packets are send via the main route if there is no link disconnection. When a node detects a high mobility means the node is not now in the frequency range, it accomplishes a one hop data broadcast to its adjacent neighbors. The node specifies in the data header that the link is not connected and thus the packet is candidate for Alternate route. Upon receiving this packet, neighbor nodes that have an entry for the destination in their alternate route table, unicast the packet to their next hop node. Data packets therefore can be passed through one or more alternate routes and are not dropped. When any node receive data packet from the alternate route its check the packet **id to** prevent from duplicate copy and operate normally and send packet to the next hop. The node that detected the link failure also sends a ROUTE ERROR (RERR) packet to the source to start a salvage route rediscovery.

Example: Figure 1 shows the alternate route construction in case of high mobility

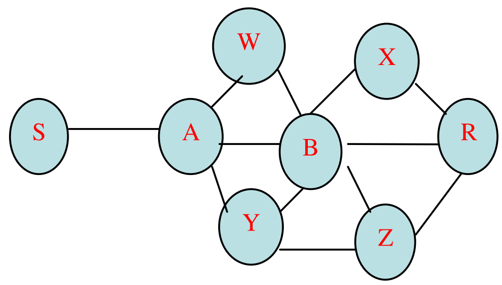

Figure 1: Alternate route construction

When the route request packet reaches the destination R then the main route < S-A-B-R > is selected. The destination node R send route reply packet to node B. the node X and Z is in the communication range of R overhear the packet and change the alternate routing table accordingly. After receiving this RREP packet, only node B relaying the packet to node A since it is in the main route. Nodes W and Y record node B as the next hop to the destination R in their alternate. route table. Finally node A send RREP packet to the Source node S.Now suppose Source node S wants to send data packet to the destination node R and the node B is moved out from the transmission range of A. After receiving the data packet from node S node A forward it to node B. The packet will fail to deliver because node B is not in the communication range of node A, then node A broadcast the packet to its neighbor (W and Y) for temporary route. Node W and Y identify the main route disconnection by reading the packet header. And looks up in its alternate route table and finds the path to the destination. Therefore the packet is delivered through the path < S-A-Y-Z-R>.

IV. COMPARISION

All the methods briefed in Literature survey are trying to improve the performance of AODV protocol. Some are based on Swarm intelligence and ant colony optimization meta heuristic , some presented the path accumulation approach that scales better in large network and under high load .One keeps the multiple route reply, according to them RREP messages are important because of its high cost. If RREP is lost a large amount of route discovery effort will be wasted. One of the authors proposed the concept of reliable distance in their work. Their new protocol restricts the region of flooding of RREQ and provides more reliable route. One of the authors extended the AODV by optimizing the overhead of both route discovery and route maintenance process. According to them when a link failure occurs in the main route then a local repair procedure is invoked between broken links. This increases the route efficiency and minimize overhead.

V. CONCLUSION

We conclude that most of the authors work to increase the performance of AODV protocol in large and high loaded network .As the use of mobile ad hoc networks (MANET) has increased manifolds, the reliability and security in MANETs has become of vital importance.

In this paper we presented a new on-demand routing approach for mobile multi-hop ad hoc networks. The approach is based on providing Alternate Route feature in case of high mobility and RREP Loss condition. And the approach shows its ability to perform well in such kind of networks.

We are working further on the implementation of the proposed protocol and compare the results with existing AODV protocol. Our future work will focus on studying practical design and implementation of the AR-AODV.

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