An improved AODV routing protocol for Manets: Backward AODV (B-AODV) Protocol

Saroj Sharma[1], Dr. Dinesh Kumar[2]
[1]Shri Ram College of Engineering & Management, Palwal
[2]Department: Computer Science & Technology, SRCEM Palwal

Abstract- **A Mobile Adhoc Network is a dynamically self-organizing network without any central administrator or infrastructure support. If two nodes are not within the transmission range of each other, other nodes are needed to serve as intermediate routers for the communication between the two nodes. Moreover, mobile devices wander autonomously and communicate via dynamically changing network. Thus, frequent change of network topology is a tough challenge for many important issues, such as routing protocol robustness, and performance degradation resiliency.**
**An Ad-Hoc network is a local area network, in which some of the network devices are part of the network for small duration communication session.**

Index Terms- **MANET, Routing, AODV, B-AODV, Ad-Hoc network etc.**

I. INTRODUCTION

We have different types of adhoc networks. We are focusing on a "mobile Adhoc network (MANET)" which is a specific type of Ad-Hoc network. A Mobile Adhoc network is a collection of autonomous nodes or terminals, which communicate with each other by forming a multi-hop radio network & maintaining connectivity in a decentralized manner over relatively bandwidth, constrained wireless links. To communicate in the network a routing protocol is needed to discover and maintain routes between nodes. The main motive of our paper is to define the node mobility and link establishment in MANET (Mobile ADHOC Network). The Ad-Hoc On-demand Distance Vector (AODV) routing protocol is intended for use by mobile nodes in an Adhoc Network. It offers quick adaptation to dynamic link conditions, low processing and memory overhead, low network utilization, and determines unicast routes to destinations within the Adhoc network. This too has some problem associated with it like Link

failure, Overhead on Bandwidth, Requirement on Broadcast Medium, etc.
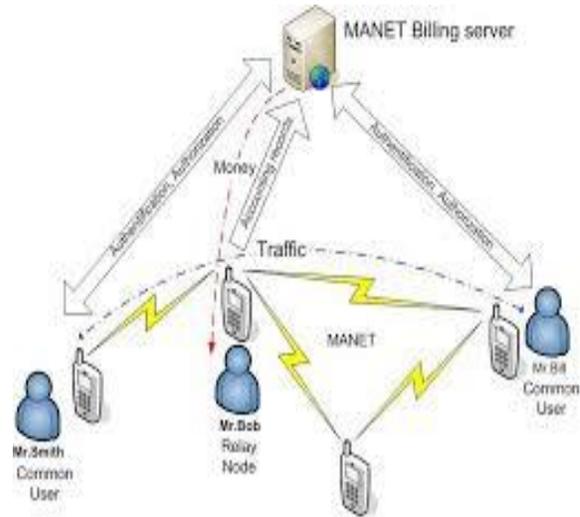
(Fig 1.1:Manet)

II. MOTIVATION

In Mobile Adhoc Networks nodes may move from one location to another on variety of node speed. As the result, the network topology changes continuously and unpredictably. Only within a short period of time neighboring nodes can lose communication link, especially when the mobility is high. In on-demand routing protocols, losing a communication link between nodes brings route breaks and packet losses. Especially, losing the RREP of AODV protocol produces a large impairment on the AODV protocol.

III. ROUTING PROTOCOLS IN MOBILE ADHOC NETWORK

Routing is the act of moving information from a source to a destination in an internetwork.

Routing is mainly classified into static & dynamic routing. It refers to the routing strategy being stated manually or statically, in the router. Static routing maintains a routing table usually written by a network administrator. The routing table does not depend on the state of the network status, i.e whether the destination is active or not. x Dynamic Routing: It refers to the routing strategy that is being learnt by an interior or exterior routing protocol. This routing primarily depends on the state of the network i.e., the routing table is affected by the activeness of the destination

The routing protocols meant for wired networks cannot be used for mobile ad hoc networks because of the mobility of nodes. MANET Routing protocols are classified into two categories: table-driven and on-demand routing protocols. The table-driven routing protocols (DSDV, CGRP, WRP, and GSR) determine the path to destination before it is needed. On-demand routing protocol (AODV, DSR, TORA, ABR and SSR) determines the route to destination when required.
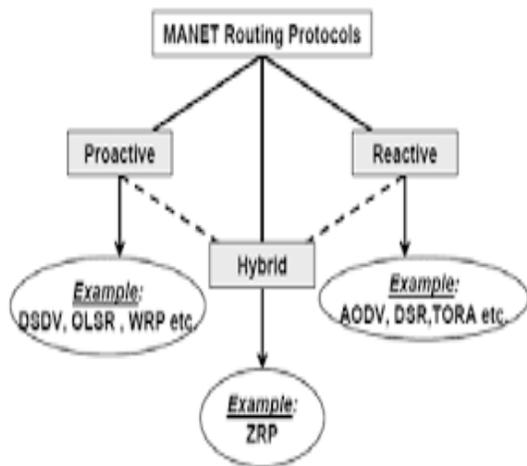
1. Proactive routing protocols : This type of protocols maintains fresh lists of destinations and their routes by periodically distributing routing tables throughout the network.Each node maintains the network topology information in the form of routing tables by periodically exchanging routing information. Routing information is generally flooded in the whole network. Whenever a node requires a path to a destination, it runs an appropriate path-finding algorithm on the topology information it maintain

2. Reactive protocols: This type of protocol finds a route on demand by flooding the network with Route Request packets .Protocols that fall under this category do not maintain the network topology information. They obtain the necessary path when it is required, by using a connection establishment

IV ADOV:

The Adhoc On-Demand Distance Vector (AODV) routing protocol is intended for use by mobile nodes in an Adhoc network. It offers quick adaptation to dynamic link conditions, low processing and memory overhead, low network utilization, and determines unicast routes to destinations within the Adhoc network.

3   PROS AND CONS OF AODV
Before describing problems of AODV, we have to Know some advantages of
AODV that can be described as –

• Routes are established on demand,
• Destination sequence numbers are used to find the latest route to the destination.
• The connection setup delay is less.

Besides these advantages, AODV has some problems that can be described as below-

• Link failure: Rapid change of topology causes that the route reply could not arrive to the source node, especially on high speed mobility. Nodes may move from one location to another on variety of node speed. The network topology changes continuously and unpredictably. Losing the RREP of AODV protocol produces a large impairment on the AODV protocol. Our thesis work focuses on this problem briefly[33].

• Overhead on the bandwidth: When an RREQ travels from node to node in the process of discovering the route info on demand, it sets up the reverse path in itself with the addresses of all the nodes through which it is passing and it carries all this info all its way.

• Requirement on broadcast medium: The algorithm expects/requires that the nodes in the broadcast medium can detect each others' broadcasts.

V. B-AODV (BACKWARD AODV)

B-AODV, which has a novel aspect compared to other on-demand routing protocols on ad-hoc networks. It reduces path fail correction messages and obtains better performance than the AODV and other protocol have? B-AODV provides good results on packet delivery ratio, power consumption and consumption delay Backward AODV perform well than the AODV because it's designed mechanism, which can be described as follows –

1. Avoid Link Failure: As AODV has a problem of link failure: losing the RREP of AODV protocol produces a large impairment; Backward AODV (B-AODV) avoids this problem by trying multiple route replies backward to the source node.

2. Reduction in Control packet overhead: Route discovery procedure based on single reply message may cause even more packet overhead for some cases. But Backward AODV reduces its control packet overhead by reducing route discovery.

3. Avoid Route Discovery: By trying multiple route replies backward to the source node reduces route discovery, this mechanism provides Backward AODV not AODV.

4. Data loss not occur: Due to link failure in AODV a data loss can occur while an assurance of providing definite route by Backward AODV avoid the chances of data loss.

VI. BACKWARD-AODV AND AODV

Metrics	B-ADOV	AODV
Link Failure	Not occur	Occur
Data loss	Not occur	Occur
Route Discovery	Less	More
Control overhead	Less	More
End-to-End delay	Less	More
Packet delivery ratio	Take less time	Take more time

VII. ROUTE DISCOVERY IN B-AODV

Since B-AODV is reactive routing protocol, no permanent routes are stored in nodes. The source node initiates route discovery procedure by broadcasting the RREQ message contains following information (Figure 5.2): message type, source address, destination address, broadcast ID, hop count, source sequence number, destination sequence number, request time (timestamp).

Type	Reserved	Hop Count
Broadcast ID		
Destination IP address		
Destination Sequence Number		
Source IP address		
Source Sequence number		
Request Time		

Figure. 5.4. B-RREQ Message Format

VIII. SOLUTION TO THE CONTROL PACKET OVERHEAD

We define the followings:

- An Adhoc network has N number of nodes.
- Required number of control messages to discover routing path for AODV is AODV(N).
- Required number of control messages to discover routing path for

B-AODV is B-AODV (N)

Let's say m nodes participate to discover a routing path. Then AODV obtains a routing path using control message shown in (1), if it does not fail in first try.

$$AODV (m) = (m - 1 + t) \quad …….. \quad (1)$$

Where t is the number of nodes relied on route reply message. If source node fails in first try, because route reply message could not arrive, the node reinitiates path discovery, the number of control

Metrics	AODV	B-AODV
Link Failure	Occur	Not occur
Data loss	Occur	Not occur
Route Discovery	More	Less
Control overhead	More	Less
End-to-End delay	More	Less
Packet delivery ratio	Take more time	Take less time

messages increase by the number of tries expressed in function (2).

$$AODV (m) = C (m - 1 + t) \quad ……… \quad (2)$$

Where C is the number of tries for route discovery.

When we assume that B-AODV has at least one stable path by a RREQ, then the number of control messages for B-AODV is in function (3). It will require only 2m-2 messages for route discovery.

$$-AODV (m) = O (2m - 2). \quad …….. \quad (3)$$

So we can conclude when c>1, then AODV causes more packet overhead than the case of c=1 on B-AODV routing.

5.5 Comparison between Backward-AODV and AODV

To evaluate performance of B-AODV with that of AODV protocol, we compare them using four metrics:

• Delivery Rate: The ratio of packets reaching the destination node to the total packets generated at the source node. We can see performance according to increasing number of nodes, packet deliver ratio of AODV and B-AODV, by increasing number of nodes brings apparent difference between the two protocols.

• Average End-to-End Delay: The interval time between sending by the source node and receiving by the destination node, which includes the processing time and queuing time. It should be noted that the delay is considered for the packets that actually arrive at the destinations. We can see that B-AODV has lower delay than AODV. The reason is that AODV chooses route earlier, B-AODV chooses recent route according to reverse request. Average end to end delay where maximum speed of node varies. As fast node mobility causes high topology changes, recently selected path may have better consistency.

• Average Energy Remained: B-AODV has more remained energy than AODV, which will be helpful for nodes to survive in network. Mean value of energy remained in each node, due to overall route discovery and route maintenance is less than AODV.

• Control Overhead: All route request messages, route reply messages and route error messages are considering for control overhead. Control packet overhead required by the transportation of the routing packets. AODV has less control packet overhead. The reason is that B-AODV floods route reply message, but route reply message in AODV is unicast along reverse path. So we can say that, half of these messages are B-RREQ.Comparison between BACKWARD-AODV and AODV

REFERENCES

[1] C. E. Perkins and E. M. Royer, "Ad hoc on-demand distance vector routing," in

[2] Proceeding WMCSA, New Orleans, LA, pp,90–10, Feb. 1990.

[3] Joseph Macker and Scott Corson., "Mobile ad-hoc networks (MANET)", December2003. http://www.ietf.org/proceedings/01dec/183.htm

[4] J. Mackar and S. Corson, RFC 2501, "Mobile Ad hoc Networking (MANET): Routing Protocol Performance Issues and Evaluation Considerations", IETF 1999.

[5] T. Lin, S. F. Midkiff, and J. S. Park, "A Framework forWireless Ad Hoc Routing Protocols,"in Proceeding of IEEE Wireless Communications and Networking Conference (WCNC),vol. 2, pp. 1162-1167, 2003.

[6] Chim Yuen Chong, Raymond Seah Kwang Wee, Sim Soon Lian, Tan Jia Hui. , "Moblie Ad hoc Networking"

[7] http://www.dsta.gov.sg/DSTA_horizons/2006/Chapter_7.html

[8] Humayun and Bakht, "Application of mobile ad hoc networks",

[9] http://www.computingunplugged.com/issues/issue200409/00001371001.html.

[10] Back word AODV: A answer to connection loss in mobile ADHOC network (MANET)