Analysis of Proactive & Reactive routing protocols in MANETS based on Power Consumption

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ABSTRACT

"Ad Hoc" means "for this purpose". Ad hoc is a temporary network connection that is mainly used for a specific purpose and to describe solutions. Mobile ad hoc network (MANET) is a collection of wireless mobile hosts dynamically establishing a short lived network without the support of a network infrastructure. In order to facilitate communication within the network, a routing protocol is used to discover routes between nodes. The primary goal of such an ad hoc network routing protocol is correct and efficient route establishment between a pair of nodes so that messages may be delivered in a timely manner. Many protocols have been proposed for mobile ad hoc network, with the goal of achieving efficient routing. The routing protocols may be generally categorized as proactive and reactive routing protocol. Power consumption in ad hoc network is a very important factor because batteries carried by each mobile node have limited power supply; processing power is limited which in turn limits applications and services that can be supported by each node. The objective of this work is to analyze the power consumption of different proactive and reactive routing protocols for high density ad hoc networks.

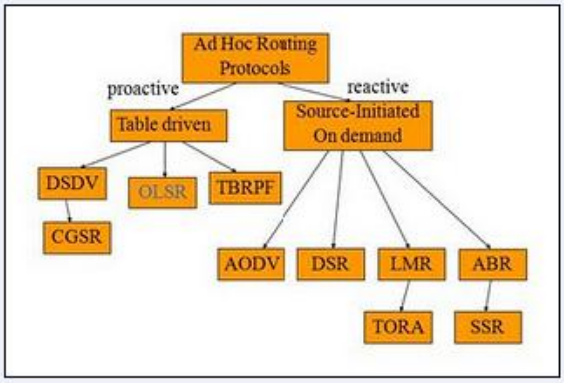
KEYWORDS

Ad hoc Network, Routing Protocols, Performance, AODV, DSDV, Routing overhead

1. INTRODUCTION

A MANET is a type of ad hoc network that can change locations and are used with the capability to establish networks at anytime, anywhere. MANETS are mobile; they use wireless connections to connect to various networks. These networks don't rely on any preexisting infrastructure because this can be a standard WI -Fi connection, or another medium, such as a cellular or satellite transmission. These networks are built, Operated, and maintained by their constituent wireless Nodes. These nodes generally have a

limited transmission Range and, so, each node seeks the assistance of its Neighboring nodes in forwarding packets.



In order to establish routes between nodes specially configured routing protocols are engaged. The unique feature of these protocols is their ability to track routes in spite of a dynamic topology.

2. AD HOC ROUTING PROTOCOLS

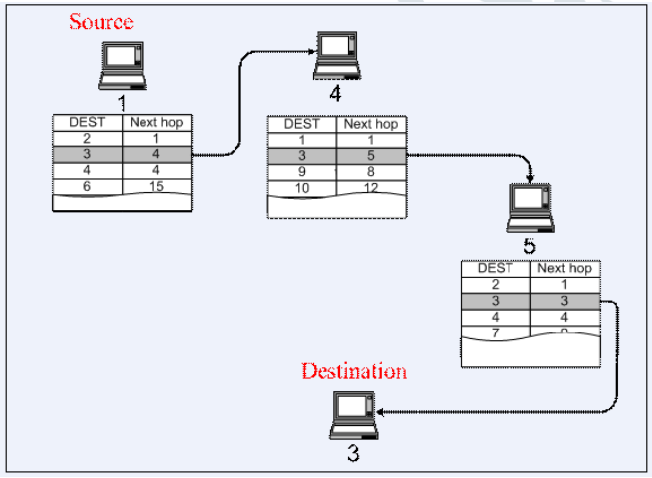
These protocols can be categorized into two main types: reactive and proactive. In proactive routing protocols, nodes maintain one or more routing tables about nodes in the network. These routing protocols update the routing table information either periodically or in response to change in the network topology. While in the reactive routing protocols there is an initialization of a route discovery mechanism by the source node to find the route to the destination node when the source node has data packets to send. When a route is found, the route maintenance is initiated to maintain this route until it is no longer required or the destination is not reachable.

Power consumption in ad hoc networks is an essential factor. Because batteries are carried by each mobile node have limited power supply, processing power is limited, which in turn limits services and applications that can be supported by each node. This becomes a bigger issue in mobile ad hoc networks because, as each node is acting as both an end system and a router at the same time, additional energy is required to forward packets from another nodes.

In this paper, review of two routing protocols, namely AODV and DSDV has been made. A detailed review of these protocols, focusing on the differences in their dynamic behaviors that can lead to performance differences has been presented.

A. DESTINATION SEQUENCE DISTANCE VECTOR(DSDV)

The review of two protocols has been discussed here.
DSDV Destination-Sequenced Distance-Vector Routing (DSDV) is a table-driven routing protocol for ad hoc mobile networks which is based on the Distributed Bellman-Ford algorithm. It can be used in mobile ad hoc networking environments by assuming that each participating node acts as a router. In this protocol, each node must maintain a table that consists of all the possible destinations. An entry of the table contains the address identifier of a destination that is the shortest known distance metric to that destination, measured in hop counts. A sequence number is also associated with each route/path to the destination. The route labeled with the highest sequence number is always used. This also helps in identifying the stale routes from the new ones, thereby avoiding the formation of loops. If we have different routes with the same sequence number, the route with better metric is used. Also, to minimize the traffic generated, there are two types of packets in the system. One is known as "full dump", which is a packet that carries all the information about a change. However, at the time of occasional movement, another type of packet called "incremental" will be used, which will carry just the changes, thereby, increasing the overall efficiency of the system. DSDV requires a regular update of its routing tables, which uses up battery power and a small amount of bandwidth even when the network is idle. Whenever the topology of the network changes, a new sequence number is necessary before the network re-converges; thus, DSDV is not suitable for highly dynamic networks. In order to avoid fluctuations in the route updates, DSDV employs a "settling time" data that is used to predict the time when route becomes stable. In DSDV, if any link is broken due to frequent topology changes, then the broken link may be detected by the layer-2 protocol [11], or it may instead be inferred if no broadcasts have been received for a while from a former neighbouring node.



B. AD HOC ON DEMAND DISTANCE VECTOR(AODV)

The Ad hoc On Demand Distance Vector (AODV) routing protocol designed for ad hoc mobile networks. AODV is capable of both unicast and multicast routing. It is an on demand protocol and it builds routes between nodes only as desired by source nodes. It maintains these routes as long as they are needed by the sources. AODV uses sequence numbers to ensure the freshness of routes. It is loop-free, self-starting, and scales to large numbers of mobile nodes*[12]*. The AODV protocol uses *route request* (RREQ) messages flooded through the network in order to discover the paths required by a source node. An intermediate node that receives a RREQ replies to it using a *route reply(RREP)* message only if it has a route to the destination whose corresponding destination sequence number is greater or equal to the one contained in the RREQ. The RREQ also contains the most recent sequence number for the destination of which the source node is aware. A node receiving the RREQ may send a route reply (RREP) if it is either the destination or if it has a route to the destination with corresponding sequence number greater than or equal to that contained in the RREQ. If this is the case, it unicasts a RREP back to the source. Otherwise, it rebroadcasts the RREQ.
Nodes keep track of the RREQ's source IP address and broadcast ID. If they receive a RREQ which they have already processed, they discard the RREQ and do not forward it. As the RREP propagates back to the source nodes set up forward pointers to the destination. Once the source node receives the RREP, it may begin to forward data packets to the destination. If the source later receives a RREP containing a greater sequence number or contains the same sequence number with a smaller hop count, it may update its routing information for that destination and begin using the better route. As long as the route remains active, it will continue to be maintained. A route is considered active as long as there are data packets periodically traveling from the source to the destination along that path. Once the source stops sending data packets, the links will time out and eventually be deleted from the intermediate node routing tables. If a link break occurs while the route is active, the node upstream of the break propagates a route error (RERR) message to the source node to inform it of the now unreachable destination(s).

Figure 1: Route Request (RREQ) flooding

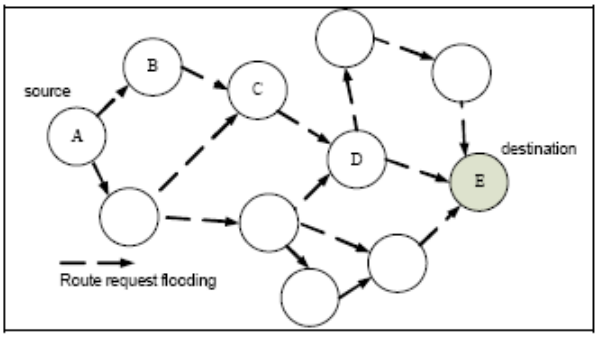
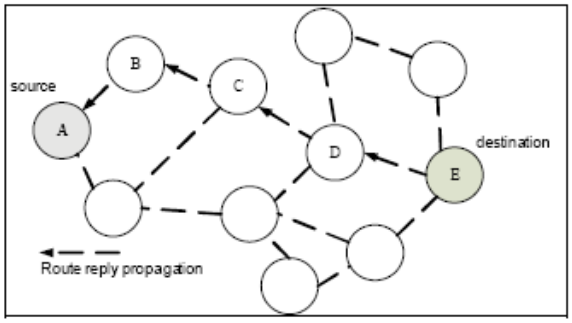


Figure 2: Route Reply (RREP) propagation



The nodes in an ad hoc network generally have limited battery power and, so, reactive routing protocols attempt to save power by discovering routes only when they are essentially required. In contrast, proactive routing protocols establish and maintain routes at all instants of time so as to avoid the latency that occurs during new route discoveries.

COMPARISON OF AODV AND DSDV

Protocol Property	DSDV	AODV
Multicast Routes	No	No
Distributed	Yes	Yes
Unidirectional Link Support	No	No
Multicast	No	Yes
Periodic Broadcast	Yes	Yes
Route Maintained In	Route Table	Route Table
Reactive	No	Yes

C. ANALYSIS

- PACKET DELIVERY FRACTION

On the basis of study we analyzed that AODV performs better when the number of nodes increases because nodes become more stationary will lead to more stable path from source to destination as route is built only when required. As the number of nodes increases which lead to more packets dropped due to link breaks, so the performance of DSDV is not much better as compared to AODV.

- END-TO-END DELAY

AODV didn't produce so much delay even the number of nodes increased. But DSDV produced delay due to frequent link failures.

- ROUTING OVERHEAD

DSDV less prone to route stability compared to AODV. DSDV achieves a low routing overhead. For AODV, the routing overhead is not so affected

CONCLUSION

In this paper we have been comparing the two ad hoc routing protocols. AODV, An On-Demand routing protocol, and DSDV a table driven protocol. In table –driven routing protocol (DSDV), constant propagation of routing information even when there is no change in topology as it has to maintain consistent, up to date routing information from each node to every other node in the network, but in the reactive routing protocol (AODV) there are no periodic updates until there is no change in the topology so it determines the route only when needed. AODV is preferred over DSDV because it uses the bandwidth more efficiently. The packet delivery of AODV is almost independent of the number of sources. DSDV generates less routing load than AODV. So, DSDV consumes more power than AODV. Hence for real time traffic AODV is preferred. For less number of nodes and less mobility, DSDV's performance is better.

FUTURE SCOPE

The quantitative comparison of the most of the ad hoc routing protocols is difficult due to the fact that simulations have been done independent of one another using different metrics and using different simulators. This paper does the realistic comparison of two routing protocols DSDV, and AODV. The significant observation is, simulation results agree with expected results based on theoretical analysis.

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