Performance Analysis Of Dynamic Source Routing Protocol In Wireless Mobile Ad Hoc Network

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Abstract

An ad hoc network is a collection of wireless mobile nodes dynamically forming a temporary network without the use of any pre-existing network infrastructure or centralized administration. Routing protocols used in ad hoc networks must automatically adjust to environments that can vary between the extremes of high mobility with low bandwidth, and low mobility with high bandwidth. I have analyzed a routing protocol called Dynamic Source Routing (DSR). As a result of its unique design, the protocol adapts quickly to routing changes when node movement is frequent, yet requires little or no overhead during periods in which nodes move less frequently. By presenting a detailed analysis of DSR's behaviour in a variety of situations, this paper generalizes the lessons learned from DSR so that they can be applied to the many other new routing protocols that have adopted the basic DSR framework. In the DSR protocol, a backup route will be initiated to transfer data (in route cache) when the initial route is broken. However, a backup route affects the overall network performance such as end-to-end delay, etc. In this paper, I showed the simulation results of the dynamic source routing protocol based on it's throughput, pause time, packet received, drop packet ratio, end to end delay, packet delivery fraction, and routing overhead. This results shows that dynamic source routing protocol is an efficient protocol to be used in Ad Hoc network and its performance is good when its pause time is increases.

Keywords: ***DSR, ADHOC Network, Throughput, PDF, Packet Dropped.***

1. Introduction

In an ad hoc network, mobile nodes converse with each other using multi-hop wireless links. There is no motionless infrastructure such as bottom stations. Each node in the network also acts as a router, forwarding information packets for other nodes. A central confront in the design of ad hoc networks is the growth of dynamic routing protocols that can competently find routes among two communicating nodes. The routing protocol should be able to keep up with the elevated degree of node mobility that often modifies the network topology drastically and impulsively. Such networks have been considered in the past in relation to cover research, often under the name of packet radio networks. Recently there has been a transformed interest in this field due to the frequent availability of low-cost laptops and palmtops with radio edge. Interest is also partly fuelled by the growing passion in running common network protocols in active wireless environments without the obligation of specific infrastructures.

Our goal is to hold out a systematic performance study of energetic routing protocol for ad hoc networks — *Dynamic Source Routing protocol (DSR)*

DSR share an interesting frequent characteristic that commence routing activities on a ―on demand‖ source. This *reactive* character of this protocol is an important departure from more traditional *proactive* protocols, which find routes among all source-destination pairs regardless of utilize or need of such routes. The key motivation after the design of on-demand protocols is the decrease of the routing load. High routing pack usually has a significant impact on low bandwidth wireless links. DSR share the on-demand performance in that it initiate routing behaviour only in the presence of data packets in require of a route. In particular, DSR uses source steering. DSR does not rely on any timer-based actions. One of our goals in this study is to take out the relative merits of this apparatus. The motivation is that an improved understanding of the virtual merits will serve as a cornerstone for expansion of more successful routing protocols for wireless ad hoc networks. The rest of the paper is organized as follows. In the following segment, we briefly review the DSR protocol. We present the related work cited in literature. We have done a simulation model and results to perform detailed evaluation of the DSR protocol, focusing on DSR protocol performance based on mobility effect. This lays down many of the circumstance of the performance study. The section concludes the mobility effects on different pause time of DSR protocol.

2. Description of Protocol

The key characteristic of DSR is the use of source routing. That is, the sender knows the absolute hop-by-hop route to the purpose. These routes are stored in a *direction cache.* The information packets carry the basic route in the packet descriptor. When a node in the ad hoc network effort to send an information packet to a destination for which it does not previously know the route, it uses a *route discovery* procedure to dynamically resolve such a route. Route detection works by flooding the network with route demand (RREQ) packets. Each node getting a RREQ rebroadcasts it, unless it is the purpose or it has a route to the purpose in its route cache. Such a node replies to the RREQ with a direction reply (RREP) packet that is routed back to the original source. RREQ and RREP packets are also source routed. The RREQ builds up the path negotiate so far. The RREP routes back to the source by traversing this conduit backwards. The route conceded back of the RREP packet is cached on the source for future use. If any connection on a source route is broken, the source node is notified using a route fault (RERR) packet. The source eradicates any route using this connection from its cache. A new route finding process must be commenced by the source, if this route is motionless needed. DSR makes very destructive use of source routing and direction caching. No special apparatus to detect routing loops is desirable. Also, any forwarding node accumulation the source route in a packet it forwards for probable future use. Several extra optimizations have been projected and have been estimated to be very effective by the authors of the protocol, as illustrated in the following. (i) *Salvage*: A transitional node can use an alternate route for its possessing cache, when an information packet meets a failed link on its source route. (ii)

Gratuitous route repair: A source node getting a RERR packet piggybacks the RERR in the subsequent RREQ. This helps hygienic up the caches of other nodes in the network that might have the failed link in one of the cached source routes. (iii) *Promiscuous listen*: When a node overhears a packet not address to itself, it checks if the packet might be routed via itself to gain a shorter direction. If so, the node propels a *gratuitous* RREP to the source of the route with this new, improved route. Aside from this, promiscuous eavesdrop helps a node to learn different routes lacking directly participating in the routing procedure.

Route Discovery

When source wants to sent a packet to destination, It places in the header of the packet a source route giving the sequence of hops that the packet should follow on its way to destination. Source obtains a suitable source route by searching its route table. If no route found for destination, Source initiates the Route Discovery protocol to dynamically find a new route to destination. When a RREQ reaches the destination node, a RREP must be sent back to source.

The destination node:

- ❑ Examine its own Route Cache for a route back to source.
- ❑ If found, it use this route to send back the RREP.
- ❑ Else, the destination node starts a new Route Discovery process to find a route towards source node.

Sender

Broadcasts a Route Request Packet (RREQ)

Receiver

If this node is the destination node, or has route to the destination send a Route Reply packet (RREP). Else if is the source, drop the packet. Else if is already in the RREQ's route table, drop the packet. Else append the node address in the RREQ's route table and broadcast the updated RREQ.

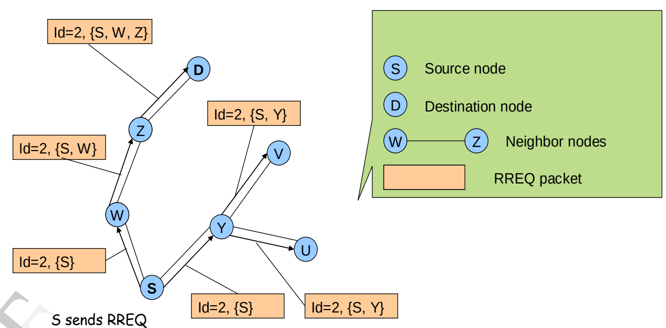

Figure1: Route Discovery

Route Maintenance

Each node transmitting a packet is responsible for confirming that the packet has been received by the next hop along the source route. If none exists, DSR-specific software takes the responsibility to sent back an ACK. When retransmissions of a packet in a node reach a maximum number, a Route Error Packet (RERR) is sent from the node back to the source, identifying the broken link and

The source will do the following steps:

- ❑ Removes from the routing table the broken route.
- ❑ Retransmission of the original packet is a function of upper layers (e.g. TCP).
- ❑ It searches the routing table for another route, or starts a new Route Discovery process.

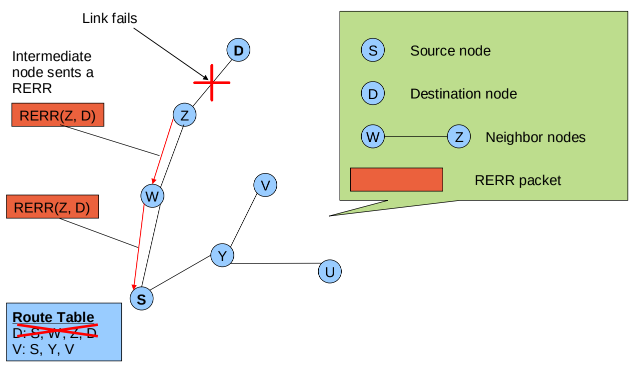

Figure 2: Route Maintenance

3. Performance Evaluation

A. Throughput VS Pause Time

The pause time was varied and the throughput was changes at every pause time during complete simulation period whose quantity was as in fig.

Table 1: Pause Time Vs Throughput (bits/sec)

Pause time (sec)	Throughput
	DSR
100	163.12
200	191.11
300	195.28
400	144.05
500	263.13

DSR shows superior throughput when the pause time is increased each time. The results shows in the figure each time we have changes the pause time and the throughput increased when the pause time increased.

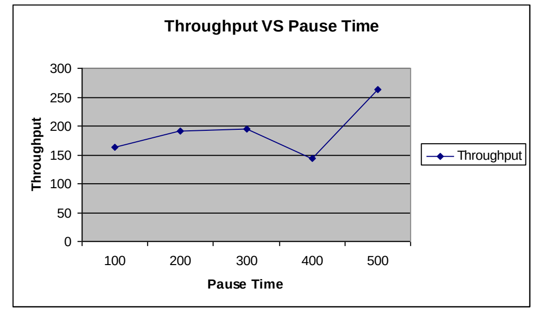

Figure 3: Throughput vs Pause Time

B. Pause Time vs Packet Dropped

The pause time was varied and the packet dropped was changes at every pause time during complete simulation period whose quantity was as in fig.

Table 2: Pause Time Vs Packets Dropped

Pause time (sec)	Packets Dropped
	DSR
100	37896
200	17959
300	18271
400	2331
500	45702

DSR performs well when its pause time is greater and number of connections increased. Each packet that the MAC layer is unable to deliver is dropped since there are no alternate routes. DSR allow packets to stay in the send buffer for 400 seconds for route discovery and once the route is discovered, data packets are sent on that route to be delivered at the destination.

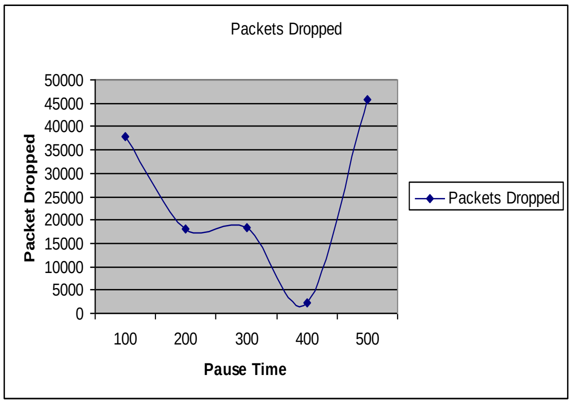

Figure 4: Pause Time vs Packet Dropped

DSR performs well when its pause time is greater and number of connections increased. Each packet that the MAC layer is unable to deliver is dropped since there are no alternate routes.

C. Pause Time vs Packet Delivery Ratio

The pause time was varied and the packet delivery fraction was changes at every pause time during complete simulation period whose quantity was as in fig.

Table 3: Pause Time vs Packet Delivery Ratio

Pause time (sec)	Packet Delivery fraction
	DSR
100	38.79
200	67.33
300	68.59
400	96.92
500	45.85

Packet delivery ratio of DSR is very less at lower pause time (high mobility). DSR perform best among all at

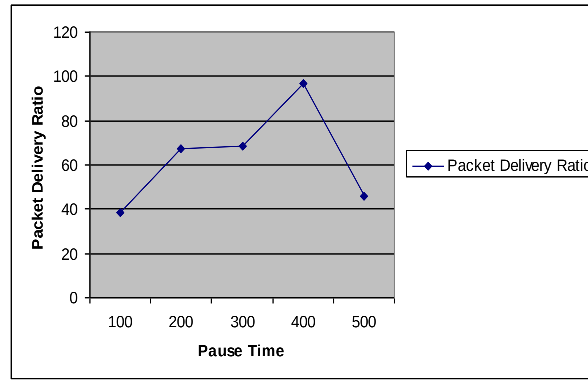

Figure 5: Pause Time vs Packet Delivery Fraction

high mobility. The reason for having better packet delivery ratio of DSR is that allow packets to stay in the send buffer for 400 seconds for route discovery and once the route is discovered, data packets are sent on that route to be delivered at the destination.

D. Pause Time vs Routing Overhead

The pause time was varied and the Routing overhead was changes at every pause time during complete simulation period whose quantity was as in fig.

Table 4: Pause Time vs Routing Overhead (MAC Layer)

Pause time (sec)	Routing Overhead (MAC Layer)
	DSR
100	34.29
200	23.19
300	19.89
400	7.95
500	17.42

In DSR protocol routing overhead at MAC layer is

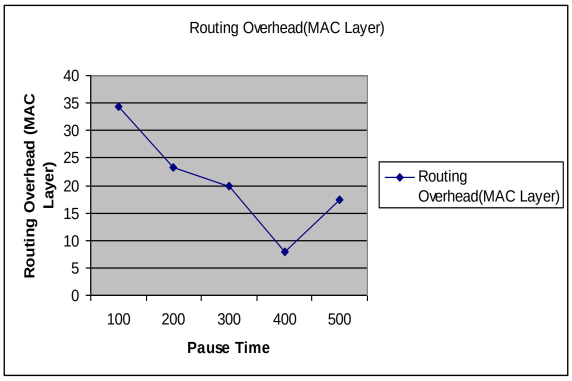

Figure 6: Pause Time vs Routing Overhead

increased when the pause time lower, at higher pause time, routing overhead (MAC layer) decreased. DSR protocol when used than nodes often changes their location within network. So, some stale routes are generated in the routing table which leads to unnecessary routing overhead.

E. Pause Time vs End-End Delay

The pause time was varied and the E-E delay was changes at every pause time during complete simulation period whose quantity was as in fig.

Table 5: Pause Time vs End-End Delay

Pause time (sec)	End To End delay
	DSR
100	5360.13
200	2776.07
300	3588.76
400	291.16
500	5823.39

High end-to-end delay can justified as DSR deliver more packets at the destination because this protocol

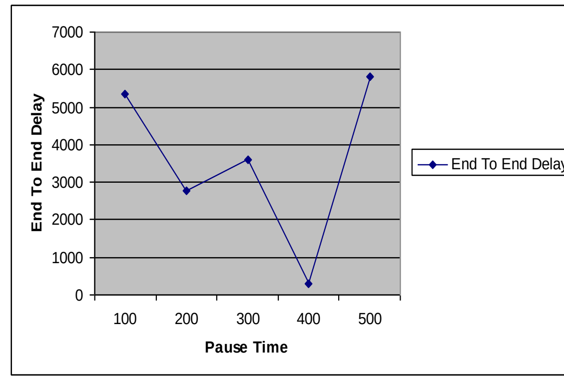

Figure 7: Pause Time vs End-End Delay

try to provide some sort of guarantee for the packets to be delivered at the destination by compromising at the cost of delay.

4. Conclusion

In this whole paper we have study the dynamic source routing protocol and analyse the performance of DSR protocol. We have implemented and carried out comprehensive analysis of uni-path on-demand routing protocol (DSR) using NS-2 simulator. Performance of Dynamic Source Routing protocol was carried out under identical traffic load and mobility patterns condition. This performance result is based on the different parameters such as throughput, packet delivery fraction, packet dropped, and routing overhead and end to end delay. The entire study on Dynamic Source Routing Protocol in Wireless Mobile Ad Hoc networks concludes with the performance of DSR which uses source routing is it delivers more packets at the destination with lowest routing overheads.

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