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Performance Analysis of Dynamic Source Routing Protocol in aspect of Cache Updation

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Abstract- In ad-hoc environment the reduction of overhead, latency and congestion presents a fundamental challenge to routing protocols. In our work we combines the advantages of proactive and on-demand routing protocols with dynamic source routing protocol to removes stale routes faster no matter how nodes move and which traffic model is used. The effectiveness is measured in terms of Packet Delivery Ratio, Packet Overhead and Throughput. The results were compared with other routing protocols such as DSR-Link Max Life, DSR(no tapping), DSR-Link Max Life(no tapping) while updating cache too with the help of distributed cache updating algorithm & results will be shown in terms of graphs and finally on the basis of simulation done in ns2 & obtaining results we conclude that proactive cache updating is key to the adaptation of on-demand routing protocols to mobility.

Index Terms- Mobile ad-hoc Network, DSR, Cache Update Algorithm, Routing Protocols, Performance Measures.

1. INTRODUCTION

Mobile Ad-hoc Network is a collection of the mobile nodes that is formed without the support of any existing network infrastructure. The MANET is self configurable network, in which nodes connect and disconnect from the other nodes in the network automatically at any point of time. The characteristics of the MANETs are flexibility, distributed operation, addressing mobility, node to node connectivity, etc. Routing of the data in the MANETs are done on the basis of the node discovery i.e. the node receive the data and forwards it to neighboring node in the path for the further transmission so that it can be reached to the particular destination.

Routing protocols for ad hoc networks are of two major types: proactive and on-demand. Proactive protocols maintain up-to-date routing information to all node. In contrast, on demand protocols attempt to discover a route only when a route is needed. To reduce the overhead and the latency of initiating a route discovery for each packet, on-demand routing protocols use route Caches. Due to mobility, cached routes easily become stale. Using stale routes causes packet losses, and increases Latency and overhead.

To address the cache staleness issue in DSR (the Dynamic Source Routing protocol) prior work used adaptive timeout mechanisms. Such mechanisms use heuristics with ad hoc parameters to predict the lifetime of a link or a route. However, a predetermined choice of ad hoc parameters for certain Scenarios may not work well for others, and scenarios in the real world are different from those used in simulations. Moreover, heuristics cannot accurately estimate timeouts.. As a result, either valid routes will be removed or stale routes will be kept in caches.

In our work, we will propose proactively disseminating the broken link information to the nodes that have that link in their caches. It is also important to inform only the nodes that have cached a broken link to avoid unnecessary overhead. Thus, when a link failure is detected, our goal is to notify all reachable nodes that have cached the link about the link failure.

2. WHAT IS DYNAMIC SOURCE ROUTING PROTOCOL?

2.1. *Overview of DSR*

Route Discovery and Route Maintenance are the two mechanisms DSR protocol performs. When a source node wants to send a packets to a destination to which it does not contain a route, it finds out the route by broadcasting a route request. The node receives the route request and checks whether it has route available for particular request in its cache or not. And gives the requested feedback to the source route whether it has route or not for particular request. Suppose the node does not have a route for

requested path then it adds the addresses to the source route and rebroadcast the route request, it sends route reply containing the source route to the source.

In Route Maintenance, the node forwarding a packet is responsible for confirming that the packet has been successfully received by the next hop. If no acknowledgement is received after the maximum number of retransmissions, the forwarding node sends a ROUTE ERROR to the source, indicating the broken link. Each node forwarding the ROUTE ERROR removes from its cache the routes containing the broken link.

2.2. *Cache Update Algorithm*

We design two algorithms for collection and Maintenance of information in cache such as:

1) Add Route: We use add route when a nodeAttempts to add a route to its cache table.

2) Find Route: When a node tries to find a Route to some destination.

The algorithm notifies the closest upstream and/or downstream nodes and the neighbors that learned the broken link through ROUTE REPLIES. When a node receives a notification, the algorithm notifies selected neighbors: upstream and/or downstream neighbors, and other Neighbors that have cached the broken link Through ROUTE REPLIES. Thus, the broken link information will be quickly propagated to all reachable nodes that have that link in their caches.

3. PERFORMANCE ANALYSIS OF DSR PROTOCOL

The performance of the proposed approach is evaluated in this section. The simulation model is discussed in Section 3.1 and the simulated results are presented and described in Section 3.2.

3.1. *Simulation Model and Parameters*

We have simulated our results using ns2.32 simulator. The mobility model is random waypoint model [1]. In this model, a node starts in a random position, picks a Random destination, moves to it at a randomly chosen speed, and pauses for a specified pause time. This model is the most widely used mobility model in ad hoc network simulations and, thus, the results here are more comparable to other published results. We chose node speed randomly from 10 -1 m/s and pause time value as 100. We used two field configurations: a 1,500 m *500 m Field with 50 nodes [4] and a 2,200 m *600 m field with100 nodes.

Number of Nodes	50
Testing Area	1500*500
Routing Protocol	DSR, DSR Cache Update
Pause Time	100
Mobility Model	Random Waypoint Model
Traffic Load	UDP, CBR traffic generator
Radio Transmission Range	250m
Packet Size	512 bytes
MAC layer	IEEE 802.11

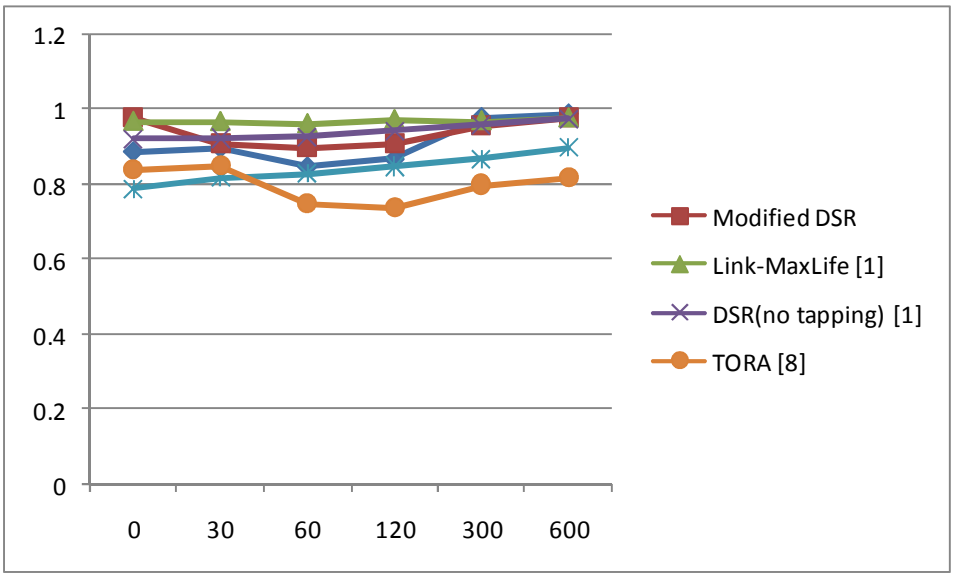
Table 1: Simulation Parameters

3.2 *Performance Metrics* & Results

We evaluate mainly the performance according to the following metrics:

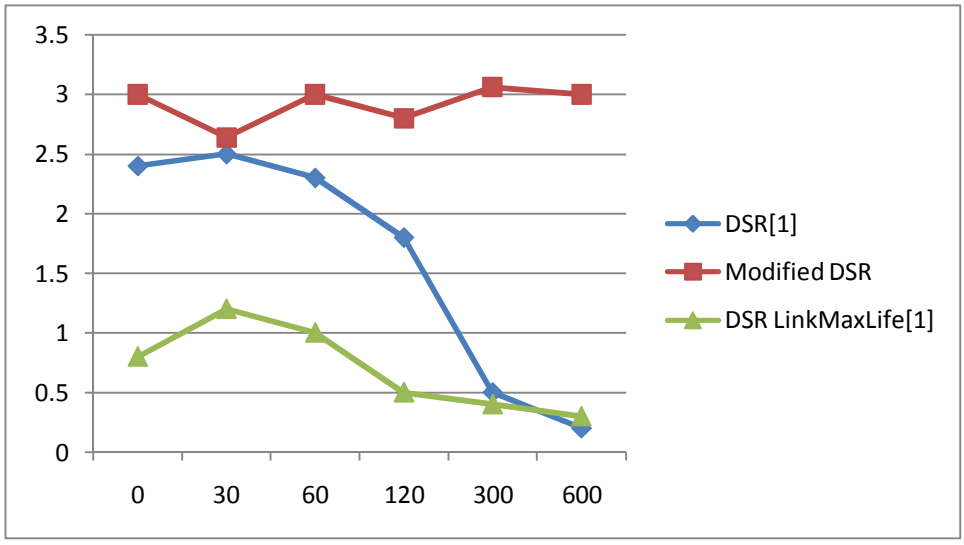
3.2.1 Packet Delivery Ratio : The ratio of the number of data packets received by the destination to the number of data packets sent by the source.

Figure 1: *Packet Delivery Ratio with respect to pause time for DSR, DSR Modified, Link-MaxLife, DSR with no tapping, DSDV and for TORA.*



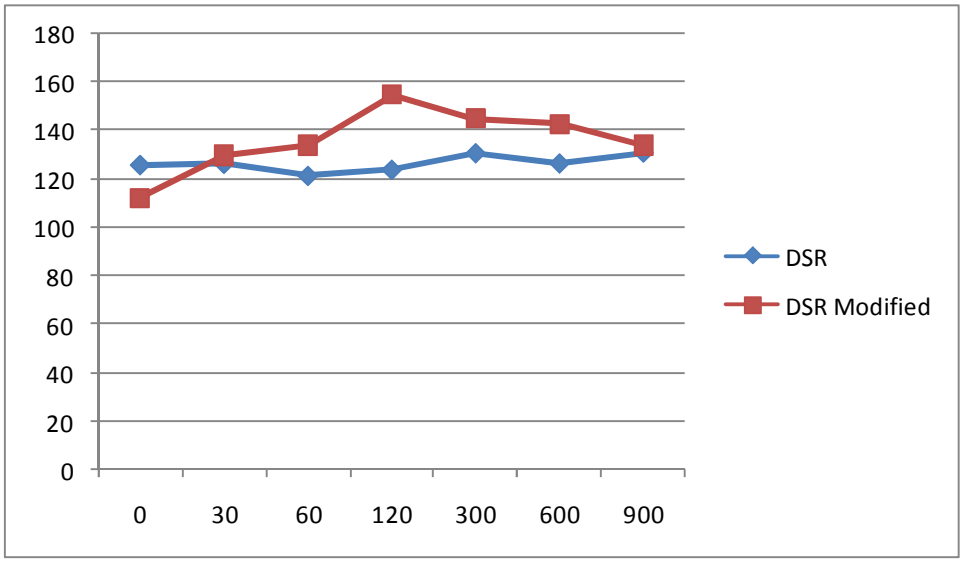
3.2.2 Normalized Routing Overhead: The ratio of the number of routing packets transmitted to the number of data packets received. For DSR-Modified, packet overhead and normalized routing overhead include route errors used for cache updates.

Figure 2: *Normalized Routing Overhead with respect to pause time for DSR, DSR Modified, Link-MaxLife, DSR with no tapping and DSR-LinkMaxLife(no tapping).*



3.2.2 Throughput: The time when a packet is sent by the source until it is received by the destination.

Figure 3: *Throughput value with respect to pause time for DSR & DSR Modified.*



4. CONCLUSION

The results of the simulation indicate that performance of the DSR protocol is superior to standard DSDV. It is also observed that the performance is better especially when the pause time is low. For higher pause time although DSR is better for most cases but their delivery ratio remains close to each other.

It is also true that any of the single protocol does not supersede the other one. There performance depends upon the different scenarios.

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