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Improving QoS of Mobile Ad-hoc Network using Cache Update Scheme in Dynamic Source Routing Protocol

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Abstract:

The route caching plays significant role in on-demand routing protocol to improve the Quality of Service (QoS). QoS is very essential for various applications of MANET. Route discovery phase is used in on-demand protocol. To avoid route discovery scheme route caching strategy is used. Frequently use of route discovery is very cost effective solution in terms of QoS parameters. Hence, in this paper we have proposed new approach for cache updating using distributed route cache update algorithm. In conventional approach only the nodes involved in the routing path knows about the route error and those node only update their cache. But in U-DSR, by following distributed cache replacement algorithm, source node broadcasts the route error information of size 60 bytes to all its neighbours. Hence all neighbours replace the stale route in their cache. Experimental evaluation is done using network simulator (NS2) of monarch group. The proposed approach improves the performance up to 30%-40% using different QoS parameters like Packet Delivery Ratio (PDR), end to end delay, packet drop and energy consumption.

*Keywords:*Mobile Ad-hoc Network, Dynamic Source Routing, Cache update, Quality of Service

1. Introduction

MANET is autonomous, decentralized, self-healing wireless network free to move from one place to another place [1]. There is a different type of application present which requires QoS of ad-hoc network. In such network routing plays key role to improve the performance of MANET applications. To achieve efficient routing various protocol in MANET is proposed in the literature [2]. When host moves, these routing algorithm are differ in the approach for searching a new path or modifying existing path [3]-[4]. The MANET routing protocol is generally categorized in to table driven, on-demand and hybrid routing protocol. The table driven routing protocol maintain up-to-date and

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consistent information in ad-hoc network, on-demand protocol established the route when they require while hybrid routing use proactive and reactive approach to discover route.

Caching becomes essential in different real time applications. In on-demand protocol, route caching plays significant role. The frequent link breakage is present in ad-hoc network due to mobility which degrades the performance of network and ultimately QoS is reducing for various applications. The alternate route needs to search when route is broken. Again this ROUTE ERROR (RERR) message is propagated to all its neighbors only. If cached route is stale then packet drop may takes place and new route discovery is initiated. This new route discovery phase incurs heavy burden on network which result in delay to reach packet to destination, number of packet drop rate is high and energy consumption is high. Again transport layer may take mistake as congestion occurs on the path. If efficient caching mechanism is present then all drawbacks are removing in MANET and QoS is improved.

This paper presents the new cache update scheme using distributed route cache replacement algorithm. The link break is carried out then all neighbors update cache by removing stale route. In our approach Updated Dynamic Source Routing Protocol (UDSR), informs all the nodes involve in the topology about broken link information using RERR packet. In UDSR by following distributed cache update algorithm, source node broadcasts the RERR information of size 60 bytes to all its neighbors. Hence all neighbors replace the stale route in their cache. This scheme improves the overall performance of the network. Contribution of paper is that instead of informing RERR message to neighbors of broken link, information is propagated to all nodes involve in topology and stale route entries are also remove from route cache. This approach result in reduce delay and packet drop rate and improve packet delivery ratio and throuput.

The paper is organized as follow. Section 1 and 2, presents introduction and overview of Dynamic Source Routing (DSR) protocol. Section 3 presents the current literature review. Section 4 presents the cache update scheme to remove stale routes. Section 4 presents simulation environment used for Network Simulator (NS2). Section 5 demonstrate different QoS parameters like Packet Delivery Ratio (PDR), delay or latency, packet drop rate, throughput, energy consumption etc. Sections 6 demonstrate simulation results and discussion based on the proposed approach. Conclusion drawn based on the above experimentation is given in section 7.

2. Dynamic Source Routing (DSR) Protocol

2.1 Overview

DSR is simple, flexible, reactive routing protocol use the source routing instead of table driven approach. When packet wants to send to same destination DSR protocol uses multiple paths considering the loop freedom property. The main distinguish between this and other protocol is that it is beaconless and doesn't require periodic hello packet to inform its neighbor about it presence [6]. Two phases are present Route Discovery and Route Maintenance. Route is discovering in Route Discovery phase of DSR protocol. When source want to send the packet to its intended destination then firstly it check, weather the route is available in cache or not. If route is not present then new ROUTE REQUEST (RREQ) is initiated by source node. Packet reaches its intended destination by updating its cache. ROUTE REPLAY (REPLY) packet is send by destination containing packet information. The Route Maintenance phase is carried out using two processes. First hop by hop acknowledge is received to check weather packet is corrupt or lose. Second end to end acknowledgment is received from two host node. If no acknowledgment is received in time then ROUTE ERROR (RERR) message is sent to neighbored node about broken link information to update their cache [13].

2.2 Route Caching in DSR

DSR uses two caching path cache and link cache [5]. The path cache stores the information about each route to its intended destination. Link cache stores the information about how many links are available in graph. Thus link cache stores large information then path cache. Cache capacity and cache timeout are also two important things in cache management of DSR protocol. Cache capacity gives size of cache in DSR protocol while static and adaptive timeout mechanism is used in cache timeout mechanism to specify, how many time stale routes are present in the cache table.