# An Efficient DSDV Routing Protocol for Ad Hoc Networks

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*Abstract*— **An ad-hoc network is a group of mobile wireless nodes that cooperatively form a network among themselves without any fixed infrastructure. Whenever a host tries to communicate with other host, the intermediate hosts in between the source and the destination should be involved to make the connection as Ad Hoc Network do not make use of any router for routing mechanism. Many Routing protocols have been proposed for Ad Hoc Networks. They are classified into Proactive and Reactive type. Proactive routing protocols use the periodic update of information to know about the current topology while the reactive routing protocols create a route to a destination on demand basis. Few of the proactive protocols are DSDV, WRP, DBF etc. while DSR,AODV, ABR are few examples of reactive protocols.**

**This paper focuses on Eff-DSDV type of routing protocol which overcomes the problem and thereby improves the performance of regular DSDV. Then comparison of two routing protocols for different network parameters is done using the simulator NS2 and studied the efficient protocol under a particular scenario on the basis of metrics such as Packet delivery ratio and Number of Packets dropped**

*Keywords*—**Ad-hoc network, DSDV, Eff-DSDV, Mobile ad hoc Network (MANET)**

## I. INTRODUCTION

An ad-hoc network is a group of mobile wireless nodes that cooperatively form a network among themselves without any fixed infrastructure. Each node in ad-hoc network forward the packets for other nodes to allow direct wireless transmission of nodes not within range to communicate. Energy is a limiting factor in the successful deployment of ad hoc networks since nodes are expected to have little potential for recharging their batteries.

In this paper, we investigate the energy costs of wireless communication and discuss the mechanisms used to reduce these costs for communication in ad hoc networks. We then focus to reduce energy consumption during both active communication and idle periods in communication. There has been considerable research on conserving power in the routing protocol [1]. Although most of these researches focused on controlling the transmission power of the sender network interface. Many Routing protocols have been proposed for Ad Hoc Networks [2]. They are classified into Proactive and Reactive type. Proactive routing protocols use the periodic update of information to know about the current topology while the reactive routing protocols create a route to a destination on demand basis. Few of the proactive protocols are DSDV, WRP,DBF etc. while DSR,AODV,ABR are few examples of reactive protocols. Even though no protocol is superior to the other, but the previous studies indicate that in general reactive protocols exhibit better performance than proactive protocols.

The rest of the paper is organized as follows. Section 2 discusses the literature survey done in this area. Section 3 gives the design of the strategy by highlighting the Eff–DSDV protocol. Section 4 describes the Simulation Environment and discusses the experimental results. Section 5 concludes the paper.

## II. LITERATURE SURVEY:

Many routing protocols have been proposed in the field of WSN. A detailed review and classification of Routing protocols for Ad Hoc Networks has been given in [3], [4]. The primary attributes of any routing protocol are simplicity in terms of implementation, loop-free to avoid the routing overhead, convergence of routes should not take much time, and the storage overhead due to the routing tables should be low.

Dynamic Source routing (DSR) which is based on on-demand route discovery [5] which pointed out that conventional routing protocol are insufficient for ad hoc networks, since the amount of routing related traffic may waste a large portion of the wireless bandwidth, especially for protocols that use periodic updates of routing tables.

The Ad hoc On-Demand Distance Vector (AODV) [6], [7] routing protocol is a reactive protocol that utilizes a route request/route reply query cycle for route discovery. Once

discovered, a route is maintained as long as needed by the source. To guarantee loop freedom, AODV utilizes per-node sequence numbers. A node increment the value of its sequence number whenever there is a change in its local connectivity information.

Many researchers have been working on the protocol optimizations to reduce the overhead at different levels in order to achieve efficiency. An effort has been made in the same direction to achieve efficiency in DSDV protocol by overcoming the problem of stale routes.

The DSDV is one of the first protocols proposed for wireless Ad Hoc Networks. It is an enhanced version of the distributed Bellman-Ford Algorithm, wherein each node maintains a table that contains the minimum distance and the first node on the shortest path to every destination node in the network. The Table updates are done with increasing sequence number tags in order to prevent loops, to deal with count-to-infinity problem, and for faster convergence [8].

## III. EFFICIENT DSDV PROTOCOL (EFF-DSDV)

In DSDV protocol, each mobile host maintains a routing table that stores the number of hops, and the sequence number for all the destinations. The routing table updates may be time-driven or event-driven. The interval between the two updates is known as the periodic route update interval. In DSDV the low packet delivery is due to the fact that, it uses stale routes in case of broken links. In DSDV the existence of stale route does not imply that there is no valid route to the destination. The packets can be forwarded through other neighbors who may have routes to the destination. When an immediate link from the host say 'S' to the destination say 'T' breaks, the proposed protocol creates a temporary link thru a neighbor which has a valid route to the desired destination. The temporary link is created by sending one-hop ROUTE-REQUEST and ROUTE-ACK messages. The host say 'S' upon finding the next hop broken link broadcasts a one-hop ROUTE-REQUEST packet to all its neighbors. In turn, the neighbors returns the ROUTE-ACK if it has a valid route to the destination and the host 'S' is not the next hop on the route from the neighbor to the destination. Each entry in the routing table has an additional entry for route update time. This update time is embedded in the ROUTE-ACK packet and is used in selecting a temporary route. In case of receiving multiple ROUTE-ACK with the same number of minimum hops, ad hoc host 'S' chooses that route which has the latest update time. Therefore, it may be surmised that the proposed Eff-DSDV follows the conventional DSDV but reduces the packet loss due to broken links.

The mechanism of Eff-DSDV is explained by the following way: If the next hop link of Host A for the required destination is active, then it uses the conventional DSDV Protocol. In case if any outgoing link breaks, and if there is no capacity in the buffer, then the incoming packet is discarded. Otherwise the packet is buffered for later transmission. The alternate route discovery process starts. The Host A broadcast a one-hop Route Request packet to its neighbors. If the next hop neighbor has a valid route to the destination in its routing table and if A is not the Next-Hop, then it sends Route Acknowledgement message enlisting its Host ID, the destination, the hop count metric for the destination and the last updated time. The Host A (in the while loop) chooses the best neighbor, based on the least number of hops to the destination. If there is more than one node having the same number of hops, then it selects the host with the latest routing update time. The packets (buffered) are then forwarded using the latest found route till, the routing table of host A is updated by the conventional DSDV routing protocol.[9]

## IV. SIMULATION ENVIRONMENT

The Simulations were carried out using NS2, which is a open source simulator available for WSN.Simulations were carried out with varying number of nodes in multiples of 5 for Eff-DSDV and DSDV. The IEEE 802.11 Distributed Coordination Function (DCF) is used as the Medium Access Control Protocol. The packet size was fixed to 1400 Bytes. Random Waypoint mobility model was used. The Traffic sources are UDP. Initially the nodes were placed at certain specific locations, and then the nodes move with varying speeds towards new locations. The nodes move with speeds varying from 10 m/sec. For fairness, identical mobility and traffic scenarios were used across the different simulations. In order to evaluate the performance of ad hoc network routing protocols, the following metrics were considered are:

*1) Packet delivery ratio:* The ratio of the number of packets originated by the "application layer" to the number of packets received by the destination.

*2) Number of Packets dropped:* The number of data packets that are not successfully sent to the destination.

The graphs below shows the performance of the routing protocols with respect to different metrics considered above. The X- Axis shows the number of nodes and the Y- Axis shows the metric considered.

In terms of Packet Delivery ratio, as shown in Fig 1, it can be seen that the performance of Eff-DSDV is better than regular DSDV in the overall scenario.

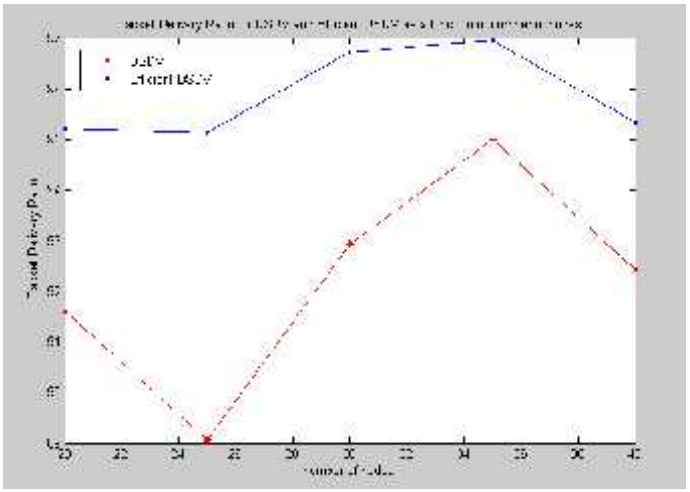

Fig1.Packet Delivery Ratio for DSDV, Eff- DSDV as a function of number of node

Fig 2 shows the performance comparison of both the protocols with respect to the metric Dropped packets. As can be observed Eff-DSDV has less no. of packets dropped and as the number of nodes increases the no. of packets dropped also increases .i.e. as the count of nodes go above 35 the packet dropping ratio increases but still less than regular DSDV protocol.

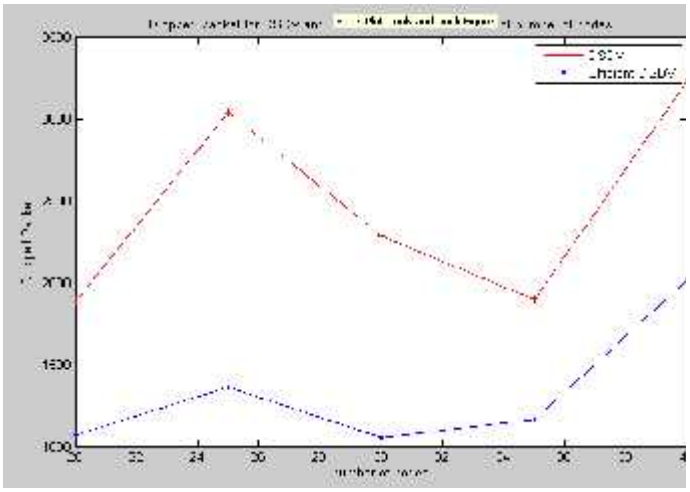

Fig 2. Dropped Packets for DSDV, Eff- DSDV as a function of number of node

## V. CONCLUSIONS

In this paper we have implemented the proposed Eff-DSDV protocol using NS2 simulator. The performance of the proposed protocol is measured with respect to metrics Packet Delivery Ratio and Dropped Packets. As the results of simulation clearly indicates that performance of the Eff-DSDV protocol is very good than regular DSDV protocol. This shows that the Eff- DSDV protocol can deliver more packets with fewer packets dropped or lose of packets when compared to regular DSDV. When the number of nodes increases beyond 35 the performance of both protocols degenerates due to the fact that a lot of control packets are exchanged and traffic increase in the scenario.

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