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The Top-N rule selection approach algorithm to split the multimedia traffic stream into multiple sub-streams prior to transmission in MANETS

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ABSTRACT

Mobile Ad-hoc Network (MANET) consists of mobile nodes that are connected via very dynamic multi-hop channels. Mobile ad hoc network represents a system of wireless mobile nodes that can freely and dynamically self-organize network topologies without any preexisting communication infrastructure. Due to characteristics like temporary topology and absence of centralized authority, routing is one of the major issues in ad hoc networks. Because of connectivity richness in mobile ad hoc networks, there often exist multiple paths between a source and a destination. Since many applications require uninterrupted connectivity of a session, the ability to find long-living paths can be very useful. MANETs are becoming more essential to wireless communication because of increasing popularity of mobile devices. However, MANETs does not seem to effectively support live video transmission and multimedia applications. The main objective of our work is to improve the performance. In this paper we propose Top-N rule selection approach algorithm. Using the cluster head as group leaders and members as leaf nodes, a shortest path multicast tree is established. This helps in transmitting multimedia data to different receivers. The multimedia traffic stream is split into multiple sub-streams prior to transmission using Top-N rule selection approach

Keywords: MANET; Multi- hop channels;

1.INTRODUCTION

MANET is a collection of dynamic mobile nodes which are self-organized and able to communicate without using a preexisting network infrastructure. Each node acts as personal device and as a router and so it is able to for- ward data packet to other nodes. In mobile ad hoc net- works the topology is very dynamic and changes frequently due to the nodes mobility. MANET's scarce re- sources such as battery based power and limited communications bandwidth make finding and maintaining a required route a key challenge. Proper design and selection of ad hoc routing protocols are needed to overcome these problems [1] – [3]. Many routing protocols have been proposed and evaluated to address challenges in MANET. These protocols can be generally classified as proactive (table-driven) routing protocols, reactive (on-demand), or hybrid of the world. In proactive routing protocols each node continuously maintains routing information about all other nodes in the network. These protocols incur considerable route maintenance overhead when compared with reactive protocols [1]-[3]. On demand (reactive) routing protocols are characterized with high route discovery latency. This is due to the fact that each Node maintains routing information only when it needs to send data to a particular destination. The examples of a protocol that are based on reactive routing are the Dynamic Source Routing (DSR) [4], and Ad hoc On-demand Distance Vector Routing (AODV) [5]. These types of protocols may incur frequent route discovery requests if the topology is very Dynamic [3]. Ad hoc routing protocols can be divided into Single path routing and multipath routing based on the number of discoverable Paths between source and destination pairs of nodes. Multipath routing is preferred to reduce both the latency of discovering a new route after a link breakage and the control overhead. This is because route discovery procedures are only needed when all the discovered paths failed. Depending on the participating nodes (or links) in the path between two end nodes, multipath routing protocols can be node-disjoint or link-disjoint. For a particular source S, and destination D, the set of node-disjoint routes consist of paths that do not have nodes present in more than one of S-D paths (except the source and destination). Similarly, the set of link-disjoint paths consist of paths that do not have certain link pre- sent in more than one of S-D paths [6]. Most of the existing multipath routing protocols are extensions of either AODV [5], or Dynamic Source Routing (DSR) [4]. Ad hoc On-demand Multipath Distance Vector (AOMDV) is a multipath extension of AODV that computes multiple loop-free link-disjoint routes [6]. Spilt Multi-path Routing (SMR) is a multipath routing protocol

that modifies DSR by finding the set of maximally node-disjoint paths between a source and destination [7].
In this paper we are interested in multipath routing protocol, such as AOMDV protocol [6] and the potential improvement that could be achieved by choosing the most spatially separated disjoint paths, instead of choosing only disjointed ones which is achieved by our Top-N rule selection approach algorithm.

2.RELATED WORK

In this section we present some related research to multipath routing in ad hoc networks. Lee and Gerla pro- posed an On-demand multipath routing protocol called Split Multipath Routing (SMR) in [7]. SMR is similar to DSR with a modified route request message that is used to find a number of maximally disjoint paths. An intermediate node forwards the received RREQs that have get through a different links. This RREQ should have a hop count that is not larger than the first received RREQ. The destination selects the route on which it has received the first RREQ packet as the shortest delay primary path. The destination node waits to receive multiple RREQs before selecting the path which is maximally disjoint compared with the primary path. Should the destination node discover more than one maximally disjoint path, it chooses those paths with the shortest hop count. Simulated evaluation results show that SMR outperforms DSR with fewer dropped packets and shorter end-to-end delay. In [8], Meghanathan has presented a simulation-based analysis of the stability and hop count of node-disjoint and link-disjoint multi-path routes in mobile ad hoc net- works. The results of the analysis have shown that node- disjoint paths were as stable as link-disjoint paths and also there was not much difference in the hop count of these paths.

Li and Cuthbert proposed an extension of AODV

Li and Cuthbert proposed an extension of AODV called Node-Disjoint Multipath Routing protocol (NDMR) in [9]. NDMR modifies AODV to allow path accumulation feature existed in DSR during route request packet transmission in addition to discovering multiple node disjoint paths. Simulation results showed that NDMR has reduced routing overhead while increasing the packet delivery ratio.
A multipath extension to DSR is proposed in [10] to support multimedia applications. The proposed protocol called Shortest Multipath Source Routing (SMS). SMS builds multiple partial-disjoint paths from source to destination to reduce route discovery and to expedite recovery when a route is broken. In [11] a new on-demand routing protocol called Spatially Disjoint Multipath Routing (SDMR) has been proposed. SDMR is capable of finding multiple paths in one route discovery. It then uses a developed metric to measure the distance between them. Finally, it chooses the most two separated paths. The new distance metric used to measure path separation proves to be congruent with Euclidean distance across nodes in the paths. A heuristic algorithm which, given a topology graph and utilizes the new distance metric, has been developed. This heuristic algorithm can discover spatially disjoint paths between source and destination nodes. The overhead of SMDR and OLSR has been evaluated both analytically, and by simulation. Results demonstrate the effectiveness of the protocol in finding spatially separated routes. In [12] An Energy Aware Clustered-Based Multipath Routing (EACMR) has been proposed. EACMR forms several clusters and finds energy aware node-disjoint multiple routes. These routes are used to transmit data from a source to destination in order to increase the net- work life time. Wesam AlMobaideen in [13] has presented a Stability- based Partially Disjoint AOMDV (SPDA) protocol which is a modification of the AOMDV protocol. SPDA finds partially disjoint paths based on links stability. The idea is that accepting partially disjointed paths that are more stable than other maximally disjoint ones could increase paths lifetime. This in turn improves MANET performance in terms of delay, routing packets overhead, and the network throughput. In [14] an improved version of SPDA was proposed by adding the number of nodes each path passes through to the path selection criteria. In the Improved SPDA (ISPDA), the available alternative paths have been utilized to transmit packets in parallel. The authors have conducted several experiments to compare SPDA and ISPDA regarding the throughput and delay performance metrics. Results show that ISPDA outperforms SPDA in most of the adopted scenarios. Grid-based Energy Aware Node-Disjoint Multipath Routing Algorithm has been proposed in [15]. This algorithm uses the same grid partitioning in the GRID routing protocol. The main difference between this algorithm and GRID routing protocols is that it considers energy-aware and node-disjoint multipath while GRID does not. Simulation results indicate that the proposed algorithm out- performs single path on-demand routing protocol such as AODV and DSR. In [16], a new routing algorithm called Ant-based Energy Aware Disjoint Multipath Routing Algorithm (AEADMRA) has been developed. It is based on Ant colony algorithms which are subset of swarm intelligence. Ant colony algorithms are concerned with the ability of simple ants (software) to solve complex problems by cooperation. AEADMRA extends GRID in a way to en- able path accumulation in route request/reply packets. This allows the discovery of multiple energy aware routing paths which are characterized with a low routing overhead. Simulation results show that AEADMRA per- forms much better than GRID.

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3.PROPOSED ALGORITHM

The multimedia traffic stream is split into multiple sub-streams based on the levels of importance of the multimedia data using Top-N rule selection approach. Then, reliable paths are determined to route different levels of multimedia packet so that most important bits can be transmitted through the less error prone reliable paths. This Top-N rule selection technique involves the selection of a subset of N rules with maximum hit-rates as per the traffic scenario. The hit rate represents the fraction of packet classification queries which is acquired using hit-counts situated in the majority switches and also it is a component of open flow specification. Initially, each target rule is examined that gives the solution whether to add the rule in the top-N list or not and also about its location to be placed. This is shown using the following condition.

If rules are self-regulating (or) dependent only on target rules
Then
The rule is added to the list
Else
Conflict results
Dependent rules are added to Top-N list keeping hold of their relative priorities.
End if

According to the above condition, rules depending on target rules are added with the provision that relative order need to be preserved in the list. The conflicts are solved by dividing the major target rule into minor target rules which are displaced with the dependent rules. Also it is necessary to remove some target rules from rule subset as there are only N rules existing in the subset which in turn minimizes the overall hit-rate offered by the rule subset. Overall, the rule selection technique is based on the following factors.

1)The derived rule count necessary to decide dependency

2)The sum of hit rate provided by the dependent rules.

3)The hit rate of target rules possibly removed in each rule examination.

Based on the above assumptions, the Top-N approximation algorithm is explained below.
Step (1): Creation of Top-N target list by selecting N-rules with highest hit rates.
Step (2): Re-arranging the created target list in step (1) in descending order.
Step (3): Applying partition decision approach which concludes whether to partition the target rule or add the rule in the Top-N list for each dependent rule.
Following the execution of the above algorithm, each target rule includes two lists. The first list represents the dependent rules (r_{dx}) that requires conflicts to be resolved and second list includes dependent list r_{dy} that has to be added to the top-N list. The partition decision process constructs empty top-N list and processes the target rules in descending sequence of hit rates iteratively. If any conflict exists with r_{dx}, each target rule is partitioned and resultant derived rules and r_{dy} are included in the top-N list. If top-N list is full, the iteration is terminated.

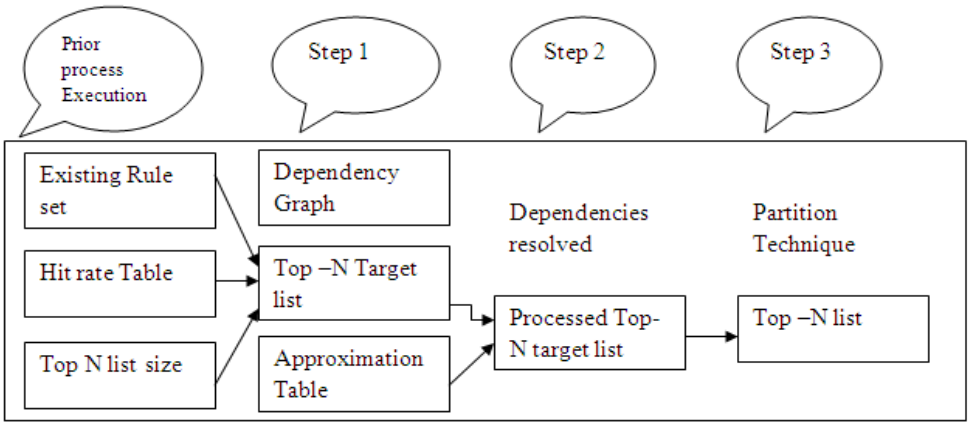

Fig 1 Flow diagram of Top-N selection algorithm

4.CONCLUSION

The multimedia traffic stream is split into multiple sub-streams based on the levels of importance of the multimedia data using Top-N rule selection approach algorithm. Then, reliable paths are determined to route different levels of multimedia packet so that most important bits can be transmitted through the less error prone reliable paths. This algorithm works very well in Energy and Bandwidth Aware Clustering Algorithm for Real-time Traffic Multicasting in Mobile Ad Hoc Networks where cluster head is efficiently selected based on the combination of important matrices Residual Energy (E), Node connectivity (C) and Available Bandwidth (B) .

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