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Efficient Multipath Routing Protocol for Mobile Ad Hoc Networks

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Abstract – The Multi-path routing technique represents routing techniques to wireless mobile ad-hoc networks. The multi-path routing protocol is achieved load balancing and it is more efficient to route failure. The ad-hoc networks are used to study Proactive Multipath Routing Protocol in Mobile Ad Hoc Networks. Recently, numerous multi-path routing protocols have been proposed for wireless mobile ad hoc networks. Performance evaluations of these protocols showed that they achieve lower routing overhead, lower end-to-end delay and alleviate congestion in comparison with single path routing protocols. The quantitative comparison of multi-path routing protocols has not yet been conducted. In this work, we present the results of a detailed simulation study of multi-path routing protocols obtained with the ns-2 simulator. The simulation study shows that the MDAOMDV protocol achieves best performance in high mobility scenarios, while MDAOMDV Multipath performs better in scenarios with low mobility and higher node density. SMR performs best in networks with low node density, however as density increases, the protocol's performance is degrading.

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1. INTRODUCTION

Now Wireless Ad hoc network can be deployed without infrastructure, and this comprise of self-organizing devices. MANET (Mobile Ad hoc Networks) can be denoted as the autonomous system of the mobile node joined via wireless link without using the any existing network infrastructure. Every node acts as a host as well as the router and forwards every other packet to visible the communication during nodes not instruct connected by the wireless links. The central challenge in the design of ad hoc networks is development of the dynamic routing protocols that can efficient search route during communicating node. The routing protocol must be able to keep up with high degree of nodes mobility that often change the network topology unpredictably and drastically (Chen & Heinzelman, 2007). The integration of the link-quality variation with broadcasting nature of the Wireless channel has disclose the direction in analysis of the wireless networking namely co-operative communications (Frias, et. al., 2007).

While working with the wireless networks, the network layer received the most of the researcher's attention. Due to this there are many routing protocols proposed by various authors for MANET with their different aims and objectives by targeting the specific application needs. At the network layer there are two major operations performed by network layer such as data forwarding and routing (Das, et. al., 2007). This two are completely different methods. The concept of data forwarding is nothing but process of regulating how the packets taken from one link and added into another link. Whereas the routing determines the route on which the data packet are routed from the source of mobile nodes to sink a mobile node. Here latter technique is imperative providing the former technique with control input. Although the bigger amount of effort have been add in routing ad hoc network, in contrast, data forwarding follow the pretty more same paradigm as in IP(Internet Protocol) forwarding in the Internet (Feng, et. al., 2008).

Fig 1.1 Basic MANET Architecture

IP forwarding is fundamentally multi-hip-hop wired networks where the packet transmission only reservation the single cable can be gained by nodes was designed for a modern Ethernet case. IP packets are transmitted one end of Ethernet cable and other. when a packet is transmitted on a physical channel however, Wireless network, this channel by all other nodes within the transmission range is checked for the most part of the research to get a packet node history as completely negative thoughts was not intended for overhearing, i.e., intervention (Xie, et. al., 2008). Thus, goal of analysis in wireless networking was to make the wireless link as good as wired ones. Suddenly, this ignores the original nature of broadcasting of wireless intercommunication link. For the mobile ad hoc network to truly succeed beyond lab and test beds, we must manage its broadcasting nature instead than fighting it. Co-operative communication is an effective approach to obtaining the goal. Research on co-operative communication physical layer community began to attract interest, but more recently its importance and utility also felt on top of the network protocol stack layers. It's a plan that top shelf net network layer wireless networking Devices can be constructed that intermediate nodes in the network data packets. Paths to the destination must follow to determine a list of a lightweight proactive use source routing protocols when the data packets is broadcast by an upstream node and move to the drift along route node has to gained by Here, it your route there and thus will come as soon as the potential on destination node. This is gained through the co-operative data interconnection at link and network layer.

On another hand, wireless networking, there are two important architectures: infrastructure (single-hop) network and mobile ad hoc (multi-hop) network (MANETs), Infrastructure network involved the cellular network and wireless local area network. Users are connected via the base station/access point and backbone network. Although user can handover during base station or access point and roam among distinct network, their mobility is bounded within the coverage area of base station or access point. Ad hoc network exclude the use of wired infrastructure. Mobile node can be form of arbitrary network "on the fly" to interchange the information without demand of pre-existing network infrastructure. Ad hoc network can extend the communication beyond the bound of infrastructure based network. A basic problem in ad hoc networking is how to deliver data packets between node efficiently without pre-determined topology or centralized control which is the important goal of the ad hoc routing protocol. Every node in network function as both a host and a router and change of network topology are divided between the nodes. Design of capability and reliable routing protocol in such a network is a challenging problem (Uddin, et. al., 2017. Reddy & Satyanarayana, 2016. Kumar, et. al., 2016. Singh, et. al., 2015).

To resolve such complexity in this thesis, we proposed naive improved disjoint multipath routing is method that exploits the underlying physical network resource by managing the multiple source destination paths efficiently. It is used for the number of purposes, involving bandwidth aggregation, reducing the end-to-end delay, enhancing the fault-tolerance, enhancing reliability, load balancing and so on as compared to the previous multi-route routing protocols.

2. LITERATURE SURVEY

Sangdae Kim et.al. (2017), In this author demonstrate (LCMRP) Low Cost Multipath Routing Protocol (LCMRP) by Adapting Opportunistic Routing which can minimized the consistent energy consumption and less affected by network scale. The proposed protocol exploits the opportunistic routing that improves the single-hop reliability in order to improve the reliability in each path. This approach minimized the number of routes, which constructed for ensuring the enough reliability.

Mueen Uddin et.al. (2017), In this creator focus on the specific issue of vitality utilization in the MANET by applying Fitness Function Method (FFM) to advances the vitality utilization in portable specially appointed systems on need of Multi Route Distance Vector (AOMDV) directing convention. Proposed convention was named as the Ad Hoc arrange on Demand of Multipath Distance Vector (DMD) with Fitness of the Function (FF-AOMDV). The wellness work was utilizing the pursuit ideal course from the source to goal and limited vitality utilization in multi-way directing distinctive in throughput.

A. Pratapa Reddy et.al. (2016), Author proposed the routing techniques known as Efficient and Stable Multi Route Routing MANET network with the Congestion Aware. This approach was extends the work to author of the existing work and where the bandwidth and delay are assumed during the routing. They estimated the residual energy of the stability node wireless network. While estimating the residual energy and also assumed the receiving energy and transferring energy of the link. Then node of the stability LET was estimated, this LET

was obtained using the motion of parameter i.e. velocity, direction of node.

Rajeev Kumar et.al (2016), designed the novel algorithm called, Exponential Ant Colony Optimization (EACO) to and locates the issue in WSN after searching the cluster heads using Fractional Artificial Bee Colony (FABC) algorithm. In first step, cluster head and find out using FABC algorithm with fitness method considering distance, energy and delay.

Ruby Singh et.al (2015), in this author proposed the naive protocol REBM. Comparison REBM Energy aware routing (EAR) protocol represented the authors and it was found the overall performance of the R-E-B-M better than E-A-R protocol.

D.A. Tran et al. (2006) maintain that routing should not only be aware, but also adaptive to, the network congestion. Hence, they proposed the routing protocol (CRP) with such properties. They produced ns-2 simulation outcome which confirm that CRP enhance the packet loss rate and end-to-end delay while enjoying the significantly smaller protocol overhead and higher energy efficiency as compared to the AODV and DSR

Rui Teng et al. (2006) Assumed organized routing operation during any two nodes in the ad hoc network that linked to wired network by an access point. To build the paths with low routing overhead efficiently, they developed the new routing facilitate of region-based routing (RBR), which managed hop count during the mobile nodes and access point to localize the route discovery within the limited topological area. Limiting region of route locate results in fewer routing messages and therefore minimize the routing overhead.

Lei Chen et al. (2007) extensively and exclusively analyzed the problem include with QoS-aware routing and refer an overview and comparison of existing QoS-aware routing protocols. In addition, open problems that must be addressed to fully support QoS-aware routing were discussed.

Victor Carrascal Friaset al. (2007) proposed MM-DSR (Multipath Multimedia Dynamic Source Routing) is the multipath routing protocol DSR-based combined with the cross-layer algorithm. This supplied QoS for multiple sources of video over IEEE 802.11b Ad Hoc network. The weaknesses of system with plain DSR and IEEE 802.11b have been analyzed and work has been done in order to enhance throughput and final user quality.

S. M. Das et al. (2007) propose and evaluate two the unicast routing protocol tailored for use in the ad hoc network formed by the mobile multi-robot team: Mobile robot distance vector (MRDV) and mobile robot source routing (MRSR). Both protocols utilize the special mobility of the characteristics of mobile robot network to perform the efficient routing.

Kai-Ten Feng et al. (2008) proposed two algorithms velocity-aided routing (VAR) algorithm decides its packet forwarding facility based on relative velocity during the intended forwarding node and destination node. The routing performance can additional be enhanced by proposed predictive mobility and location-aware routing (PMLAR) algorithm, which in-corporate the predictive moving behaviors of the mobile nodes in protocol design. The area for packet forwarding is determined by the predicting future trajectory of destination node.

Xie Xiaochuan et al. (2008) proposed Link reliability based on the hybrid routing (LRHR) which was the naive hybrid routing protocol for the tactical MANET. Contrary to traditional single routing strategy, multiple routes are established during the pair of source-destination node. In hybrid routing strategy, the rate of topological vary supplied a natural mechanism for switching dynamically during table-driven and on-demand routing. The network topology can vary quickly and unpredictably mobile ad hoc network. Because wireless link capacities are the usually limited, congestion is potential in the MANETs. Hence, balancing load in MANET is vital since node with high load will deplete their batteries rapidly, thereby enhancing the probability of disconnecting or partitioning the network.

Chai Keong Toh et al. (2009) discussed the several load metrics and condense the principles behind various existing load balanced and ad hoc routing protocols. Lastly, a qualitative comparison of several load metrics and load balanced routing protocols is re-presented.

H.Zafar et al. (2009) proposed the multipath routing facilitate, referred as shortest multipath source (SMS) routing based on the dynamic source routing (DSR) The mechanism has two naive aspects as compared with the other on-demand multipath routing facilitate it achieves the shorter multiple partial-disjoint route and allow the more quickly recovery from path break. The performance distinguished is investigated using the NS-2 under situations of changing the mobility, offered load and network size.

Sunho Lim et al. (2009) proposed the new communication mechanism, called Random Cast, via which is the sender can identify desired level of the overhearing, making a prudent balance during energy and routing performance. In addition, it minimized the redundant rebroadcasts for the broadcast packet and thus, saves more energy.

Wefa Liang et al. (2009) focused on design of energy efficient routing algorithms. Specifically, they assumed the following minimum-energy all-to-all multicasting issue. Given an all-to-all multicast session consisting of the group of terminal nodes in a the wireless ad hoc network, where transmission power of every node is either fixed or adjustable, consider that the every terminal node has an message to share with every other, problem is to build the shared multicast tree spanning all terminal nodes such the total energy consumption of the realizing to the all-to-all multicast session by tree is minimized. Multipath routing application Voice over IP and video delivery these applications demand the continuous data transmission in network so it demands quickly failure locate mechanisms. Already some of the proactive rapidly failure recovery mechanisms are available. They are used to enhance the network performance during the failure transients.

Yong Oh Lee et al. (2010) proposed method proposed by is to make some changes in routing table entries, extra addresses etc. These changes can be constructing the disjoint paths while retaining the recovery route lengths close-up to important routes. This approach also illustrates the possibility to extend proactive recovery mechanisms to supplied support for nearly disjoint routes.

S.Kalwar (2010) claimed that protocol is a group of protocol for communication. Reactive protocols are the types of communication protocol. The important purpose of the reactive protocols is react based only "on the demand." It is just like saying that, "When you need me, tell me." MANETs run risk of attack by malicious nodes.

X.Li et al. (2010) incorporated model of trust to MANETs and build the straight forward trust model to gauge the neighbors 'behaviors' forwarding packet like the trust based reactive multipath routing protocol and ad hoc on-demand trusted path distance vector (AOTDV) for minimizing the risk from malicious nodes,. This protocol was able of searching the multiple loop free paths in one path discovery task. These path were evaluated by hop measures and trust values. This two dimensional evaluation provides a flexible and feasible approach to the select shortest route from candidates that reached the needs of data packets for dependability or trust. Various experiments were conducted to compare these rules and results show that AOTDV enhance the packet delivery ratio and also safe from the attacks.

3. PROPOSED METHODOLOGY

In the MANET Analysis and security is important objective is to present the efficient multi-route and multi-hop routing protocol for MANET. This section presents the design of proposed routing protocol Node Disjoint Multipath

First we proposed novel Node Disjoint Multipath Communication which is based on below summarized steps:

1. Searching all the present disjoint routes from the source to descend through a routing protocol.

2. Consider the hop count all nodes from the destination node.

3. Calculate novel Source Initiated Bulged Transmission Rate by distributing current TR by neighboring node of source and then assign the naive TR to every route.

5. If received packet is

I. from higher Hop count node and

II. from the path of which the current node is member Then accept and forward the packet.

6. Else drop the packet.

7. Repeat step 5 and 6 till packet reaches the destination.

Algorithm 1 represents above phases in path discovery and route selection task of the proposed routing protocol.

Algorithm 1: Multipath Node Disjoint Route Selection

Input:

N: be the set of nodes in the network.

Ni: be the neighbor set of node i, where, Ni = {N-S}.

S: Source node.

J: The group of node from which nodes I is receive the route request packets.

D: Destination nodes

Thus, R= Ni –J, Set of node which node I is transmitted the path request packet.

Step 1: Source node S: (Initiate the task of the node discovery)

- Generate RREQ packet with field value group as,

SA=S,

DA= D,

ID= I,

TTL= T,

LSD=0,

B= 0,

Hops=H and

PATH={S},

Velocity values,

Directions and

Positions co-ordinate

- Send RREQ packets to all the neighbor nodes j with, Bj >= B

Step 2: If RREQ packet is receiving from the node D, then node D.

- Receive the all path and arriving to Wait Period, W.
- Choose the nodes to disjoint route during them.
- RREP packet generate for uni-casting to source, the Bandwidth field of RREP packets is updated with cumulative bandwidth the path and the PATH list is appended with D.
- D uni-cast nodes all disjoint the path back to source node S.

Step 3: The middle node i, on receiving RREQ packet:

O If i is present in PATH list then it check, else drop packet and exit. Else, append i, to PATH list and wait for the period W. and receives the all RREQs with ID =I and updates the NIT.

O From NIT, choose node j ε J, with highest LSD values. And put the value of Bj to B. In the case LSDjj=LSDk, k ε J, choose one with lesser hop value.

O Transmit RREQ to node r ε R, with LSDr >= LSD thr and Br>= B. Also update velocity of direction and position co-ordinate in RREQ with its own value.

Step 4: Measures the all disjoint paths from S to D, let's suppose there is Dp number of multiple routes selected.

Step 5: Measures the hop count for every route selection from Dp

Step 6: Compute and Assign the Transmission Rate (TR)

New_TR = TR/size (Dp)

Step 7: Data Transmission

- If packets the is received

O Hop count node from higher and

O from path of the recent node is member

 Accept packet and forward the packet.

 Else Drop the packet

- Repeat the task until packet reaches destination D

Step 8: Stop

Algorithm 2: Mobility Aware Algorithm

Step 1: When the node is i receive overhear the packet P, IF the node i is final destination address, consumes the packet. GOTO END;

Step 2: (Assume P belongs to <SAk,DAk> flow.) Compare <SAk,DAk> to all the valid entries in hop comparison array;

Step 3: IF there is no match with entries, store the <SAk,DAk,HCk,NAk> in hop comparison array;

Step 4: IF packet is destined to i is next-hop node, task packet for the forwarding further.

Step 5: (Assume that it matched the with an entry <SAk,DAk,HCj,NAj>) IF (HCk − HCj > 2), a short-cut is search, node I, does following:

Step 5.1: Transfer the message to NAj to update routing table such that next hop address for the destination node DAk is modified to address of the node i;

Step 5.2: Modify its routing table by making next hop address for the destination DA k as NA k;

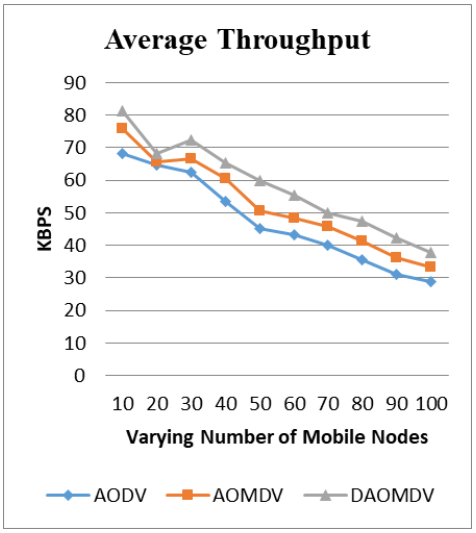
Step 5.3: Modify the hop comparison array, delete entry corresponding to <SAk,DAk>;

Step 6: Return the delay efficient path.

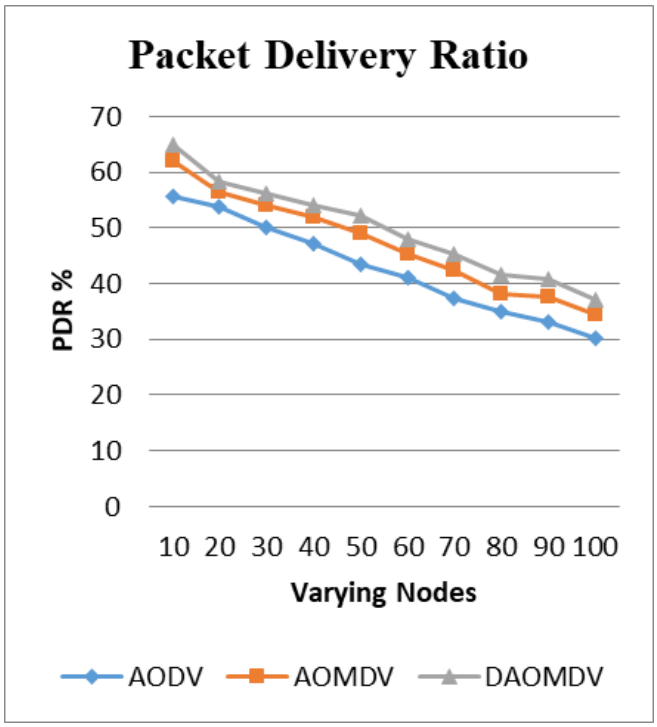
Step 7: Stop.

4. RESULTS

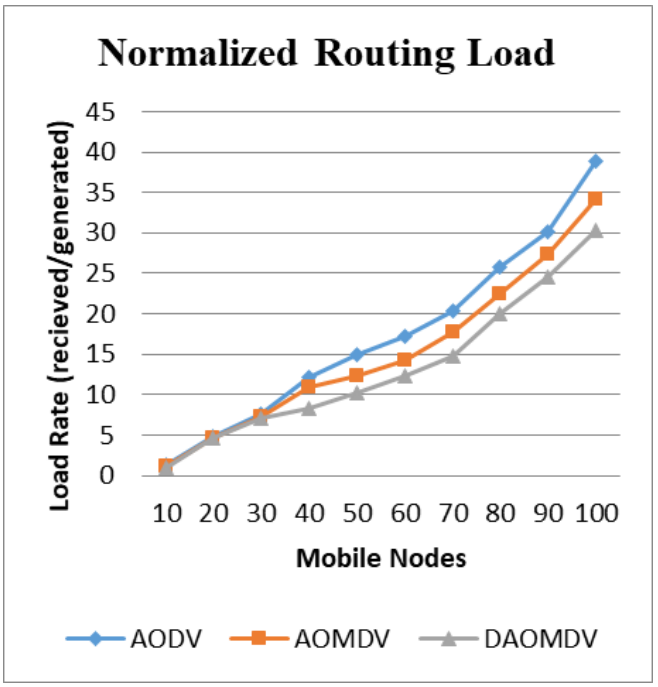
We represent a comparative outcomes during three designed and SRP (Simulated routing protocol) is 1) AODV 2) AOMDV and 3) DAOMDV. The results are measured with varying the mobile nodes from 10 to 100. There are four key performance metrics measured which can widely use for QoS performance analysis in MANET routing.



Performance Analysis of Average Throughput in Phase I



Performance Analysis of Packet Delivery Ratio in Phase I



Performance Analysis of Normalized Routing Load in Phase I

5. CONCLUSION AND FUTURE WORK

All For MANET, directing methods play the critical position in grouping to gain the Q-o-S arrangements. Conventional MANET is the steering conventions are experiencing all the more directing overhead and lessened the bundle conveyance proportion because of the single way intercommunications in MANET. We examined the quantity of existing only course and multipath procedures by accepting the unmistakable system condition and parameters, for example, portability speed, vitality utilization, stack and so forth. However, there is need proficient multipath directing technique which accomplishes more enhanced Q-o-S execution by considering the changing portability speed of versatile hubs. To address these examination issues, this exploration proposed new calculation for MANET multipath directing convention with the objective of versatility and proficiency. This new approach depends on as of late introduced existing disjoint based multipath directing convention DAOMDV. This new convention is called as MDAOMDV.

The recreation is planned with two unique targets, for example, 1) QoS Assessment: we outlined new calculation for accomplishing and improved QoS execution when contrasted with the current AODV, AOMDV and DAOMDV directing conventions. The outcomes are analyzed by expecting three imperative execution measurements of any steering convention as throughput, end to end postpone and parcel conveyance proportion. In all cases, proposed steering conventions indicating expanded the execution when contrasted with existing strategies. 2) Versatility Assessment, in which we planned unique systems to assert the adaptability of

proposed multipath steering convention. From the test comes about it demonstrating the throughput execution of proposed strategy is enhanced by 37 % when contrasted with existing multipath steering technique.

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