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Balanced and Energy Efficient Multipath Routing With Robust Transmission in Mobile ADHOC Network

N. Suresh
Research Scholar, Department of Computer Science,
Rathinam College of Arts & Science, Pollachi Main Road, Coimbatore, India.
Orcid: 0000-0002-0484-6973

Dr. J. Thirumaran
Professor, Department of Computer Science,
Rathinam College of Arts & Science, Pollachi Main Road, Coimbatore, India.

Abstract: - The nodes in MANET are constrained with limited power for their vital operations since the connectivity of the network will go down as soon as node energy gets exhausted. Node failures due to power constraints cause system failures and hence minimize end-to-end connectivity in the network. And also mobility and congestion of the nodes lead to frequent link failures and packet losses affecting the QoS performance of the protocol. In this work, we used an effective proposed scheme, Balanced and Energy Efficient Multipath Routing with Robust Transmission in MANET to overcome above limitations in mobile ad hoc networks. Our proposed scheme which maximizes end-to-end connectivity in the network and minimizes faults at link or/and node level. A set of multiple paths are established from source to multicast destinations using energy efficient neighbor node selection mechanism. It provides effective load balancing at the node and finds a stable path between the source and destination meeting the delay requirement. Simulation results show that the proposed protocol outperforms in terms of packet delivery ratio, throughput, routing overhead and average end to end delay.

Keywords: - personalization, web, search, privacy, user, profile and security.

INTRODUCTION

Wireless Mobile Ad Hoc Networks (MANETs) have emerged as an advanced networking concept based on collaborative efforts among numerous self-organized wireless devices. MANET is a network where no fixed infrastructure exists. Such networks are expected to play vital role in future civilian and military settings, being useful to provide communication support where no fixed infrastructure exists or the deployment of a fixed infrastructure is not economically profitable and movement of communicating parties is possible. The topology of MANETs is dynamic, because the link among the nodes may vary with time due to device mobility, new device arrivals, and the possibility of having mobile devices.

The routing protocol design must take into account the physical limitations and constraints imposed through the ad hoc atmosphere in order that the ensuing routing protocol does now not degrade process performances. Due to the fact that in MANET, there is no constant-infrastructure akin to base stations, cellular gadgets must function as routers with a view to maintain the know-how about the community connectivity, for that reason the traditional routing protocols are not able to be supported effectively by way of ad hoc networks. Several research experiences have been launched to be trained this hassle, these defined with the aid of the IETF MANET group can be classified into two classes: proactive protocols and reactive protocols. MANET's technology offers each new challenges and possibilities for many functions. The major challenges for ad hoc technology is cozy and efficient routing, due basically to MANET aspects (e.g., open medium, lack of centralized administration, nodes mobility).

A couple of techniques had been proposed to secure ad hoc routing. Some present options in Wireless networks hire mechanisms used to guard routing protocols in wired networks that are centered on the presence of a centralized infrastructure. These options aren't correct for a decentralized ad hoc community. In mobile advert hoc networks, neighbor discovery is the procedure through which a node in a community determines the whole number and identification of different nodes in its vicinity.

Mobile Ad Hoc Network (MANET)

A MANET is a collection of cell nodes sharing a wireless channel with none centralized control or centered conversation spine. MANET has dynamic topology and each and every mobile node has restricted resources similar to battery, processing energy and on-board reminiscence. This form of infrastructure-much less community is very priceless in quandary in which normal wired networks isn't possible like battlefields, average disasters and so forth. The nodes that are within the transmission range of each and every different communicate straight or else conversation is finished by means of intermediate nodes which can be inclined to forward packet therefore these networks are also known as multi-hop networks.

Figure 1: Mobile Ad Hoc Network [4]

Ad-hoc network is clearly includes ad-hoc and network in which the word 'ad-hoc' is a Latin word specifies the means 'for this' or 'for this handiest' and the phrase community specifies a collection of computers and cellular nodes connected through wired or Wireless link.

Mobile ad hoc network nodes are furnished with wireless transmitters and receivers making use of antennas, which could also be totally directional (factor-to-factor), Omni directional (wide-forged), often steerable, or some mixture. At a given factor in time, depending on positions of nodes, their transmitter and receiver insurance plan patterns, conversation energy levels and co-channel interference levels, a wireless connectivity in the type of a random, multihop graph or Adhoc network exists among the many nodes. This ad hoc topology may regulate with time because the nodes move or adjust their transmission and reception parameters. The characteristics of these networks are summarized as follows:

Conversation by way of wireless Networks

1) Nodes can perform the roles of each hosts and routers.
2) Bandwidth-restrained, variable ability hyperlinks.
3) Limited physical security.

Major challenges in MANET

Regardless of the attractive applications, the points of MANET introduce a few challenges that need to be studied cautiously earlier than a large industrial deployment will also be anticipated. These include

- **Dynamic topologies**

  Nodes are free to maneuver arbitrarily; hence, the network topology--which is typically multi hop, may change randomly and speedily at unpredictable times, and may include both bidirectional and unidirectional hyperlinks.

- **Routing**

  The topology of the community is continuously changing; the limitation of routing packets between any pair of nodes turns into a challenging assignment. Most protocols will have to be based on reactive routing as a substitute of proactive.

- **Device discovery**

  Identifying significant newly moved in nodes and informing about their existence need dynamic update to facilitate automatic finest route choice.

- **Bandwidth**

  Constrained-variable potential hyperlinks: wireless hyperlinks will continue to have greatly scale down capability than their hardwired counterparts.

- **Multicast**

  Multicast is fascinating to support multiparty wireless communications. Since the multicast tree is now not static, the multicast routing protocol ought to be in a position to cope with mobility including multicast membership dynamics (depart and join).

STUDY OF EXISTING WORK

In previous work, we used a stable and energy-efficient routing technique. In the proposed method, quality of service (QoS) monitoring agents collect and calculate the link reliability metrics such as link expiration time (LET), probabilistic link reliable time (PLRT), link packet error rate (LPER) and link received signal strength (LRSS). In addition, residual battery power (RBP) is implemented to maintain the energy efficiency in the network. Finally, route selection probability (RSP) is calculated based on these estimated parameters using fuzzy logic. Simulation results show that the proposed routing technique improves the packet delivery ratio and reduces the energy consumption.

In this technique, the QoS monitoring agents collect and estimate the link reliability metrics link expiration time (LET), probabilistic link reliable time (PLRT), link packet error rate (LPER) and link received signal strength (LRSS) [17] in order to ensure stable routing. These metrics are used to find reliable links in MANET. In addition, they reduce the number of route reconstructions in the wireless network. Next, the residual battery power (RBP) of a node is also estimated for providing energy conservation.

In stable multipath route discovery phase, an enhanced stable path collection mechanism based on source routing and adaptive ad hoc on-demand multipath distance vector (AOMDV) is designed to discover multiple paths between the source and the destination. For selection of optimal routes, a fuzzy logic-based selection technique is applied. Here, the LET, PLRT, LPER and LRSS and RBP are taken as input for the fuzzy logic engine and based on the results of fuzzy rules, the route selection probability is estimated as output. In pre-emptive route repair phase, the moving node, which is responsible for the occurrence of communication grey zone, is detected based on the above designed metrics. An appropriate node is selected to do route repairand start fast local route repair.

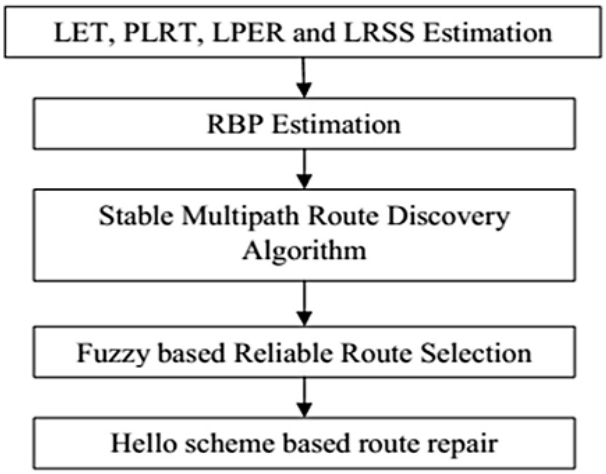

Figure 2: Existing System Structure [7]

The existing work contains the following drawbacks, such as,

1) It suffers from too many route breaks and route rediscovery procedures due to the occurrence of communication grey zone.
2) The extra computation for link stability factor causes the slightly higher delay.
3) The route reconstruction is reduced only up to 50%.
4) Here the data and encoding packets has higher packet overhead.
5) Due to lack of link capacity resources, flows that could have been routed across sufficiently robust routes cannot be accommodated and are blocked.

PROPOSED SYSTEM STRUCTURE

In this work, we used an effective proposed scheme, Balanced and Energy Efficient Multipath Routing with Robust Transmission in MANET to overcome limitations in mobile ad hoc networks. Our proposed scheme which maximizes end-to-end connectivity in the network and minimizes faults at link or/and node level. A set of multiple paths are established from source to multicast destinations using energy efficient neighbor node selection mechanism. It provides effective load balancing at the node and finds a stable path between the source and destination meeting the delay requirement. Simulation results show that the proposed protocol outperforms in terms of packet delivery ratio, throughput, routing overhead and average end to end delay.

Here we consider these major issues and propose a balanced Energy efficient QoS based Routing protocol in which route discovery mechanism of AODV is modified to include multiple metrics of signal strength, queue length, drain rate and the delay. The protocol finds a stable path between source and destination based on received signal strength and provides load balancing at every node by adding some constraints (queue length and drain rate) before finding the path between source and destination.

Multipath routing is nothing but establishing a multiple routes between the source node and destination node. Due to the multipath routing the source nodes are capable of maintaining connections even if one route failure occurs during fault tolerance. Through the multipath routing protocols it is possible to reduce the data transmission failures and the delay times caused by route disconnection.

Route Discovery

In route discovery phase, the source node initiates the extended RREQ message to the destination node. When the destination node receives the Route Request (RREQ) packet, it will produce the Route Reply (RREP) packet and send back to the source node. The RREQ packet will be received by the intermediate nodes within the range of wireless transmission. If these nodes are not destination and do not receive the RREQ with the same packet ID, they will forward the RREQ. In this case, this proposed system applies an energy threshold functions in route discovery, in order to filter out the nodes with lower residual energy and to reduce the broadcast operations in route discovery. If the calculated energy value is greater than the threshold value of energy, the RREQ message forwards to the next neighbour node, otherwise it will be discarded.

The transmission power is computed at every node in the network. When the RREQ message arrive at next node, the transmission power and residual energy is updated into the route list entries. In route discovery phase, the source node initiates the extended RREQ message to the destination node. When the destination node receives the Route Request (RREQ) packet, it will produce the Route Reply (RREP) packet and send back to the source node. The RREQ packet will be received by the intermediate nodes within the range of wireless transmission. If these nodes are not destination and do not receive the RREQ with the same packet ID, they will forward the RREQ. In this case, this proposed system applies an energy threshold functions in route discovery, in order to filter out the nodes with lower residual energy and to reduce the broadcast operations in route discovery.

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Route Selection

In route selection phase, when the source node receives the RREPs packets from the neighbour nodes, it starts a timer and collects the RREPs during the period. Then the source node begins to calculate the values P based on the corresponding records in RREPs according to Eq. 2 and choose the path with the maximum value P as the optimal route. Finally, data packets are sent through this path with the transmission power recorded in RREP.

Route Maintenance

When a node finds a failure of route, it will send a route error (RERR) packet to the previous node to indicate the route breakage. The intermediate node which receives this RERR message informs to the source node. Then the source node will remove the corresponding item from the routing table and switch to alternate path.

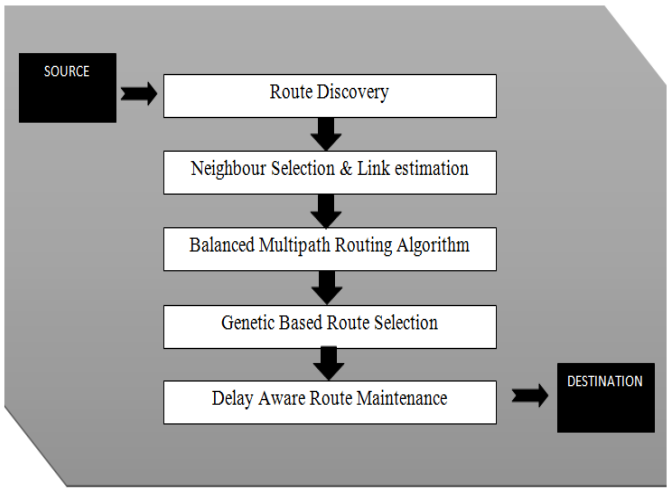

Figure 3: Proposed System Structure

The proposed system contains the following advantages over the existing system, like,

1) The outperforms proposed in terms of packet delivery ratio, normalized routing overhead, throughput and average end to end delay.
2) Here obtained motion parameters i.e. velocity, direction of the nodes. Based on these parameters the network selects the path to transmit the data packets between the nodes.
3) This approach is that best path can be chosen during the routing based on all these factors. Also the battery level of the nodes can be taken care in the network. This results in network's good throughput and high efficiency.

IMPLEMENTATION & RESULTS

The proposed design is carried out making use of NS-2 and it's analyzed via for the reason that distinct parameters like Packet misplaced Packet delivery ratio, energy consumption and finish- to-finish delay. In the proposed system selects the stable direction to cut back the false role and Packet lost and there by means of increases the packet delivery ratio and energy consumption. Applications in NS-2 are scripted in OTcl and results of simulations can be visualized using the network Animator (NAM) and Xgraph.

The simulator constitution makes use of two languages: OTcl scripting on the entrance end, and C++ on the back finish. OTcl scripting to make a simulation situation, which can include community add-ons like nodes, routers, and hyperlink bandwidth. The again end is C++. The OTcl code links to the C++ documents. When the OTcl code runs, it calls the imperative C++ code to execute a precise undertaking.

The simulation is implemented within the community Simulator 2. In Linux working method with Ubuntu as the interface software. The mobility mannequin uses the random waypoint model. There are forty nodes defined in a simulation field of measurement 1000m x1000m. The mobility of nodes is limited to 5ms. The site visitor's mannequin chosen is steady Bit expense (CBR) connections with packet measurement of one thousand bytes to emulate traffic over the network. Each and every packet begins from a random location to a random destination with a randomly chosen pace.

1) Packet Delivery Ratio

The ratio between the, number of acquired information packets to the quantity of whole knowledge packets dispatched by means of the source.

2) End-to-End delay

The common time elapsed for offering a knowledge packet within a victorious transmission from source to destination.

3) Packet Lost

Discarding of data packets in a network when a router is overloaded and it's not be given any incoming data at a given moment.

4) Energy consumption

The energy consumption for the entire network, it's together with transmission and processing energy consumption for both the data and manage packets.

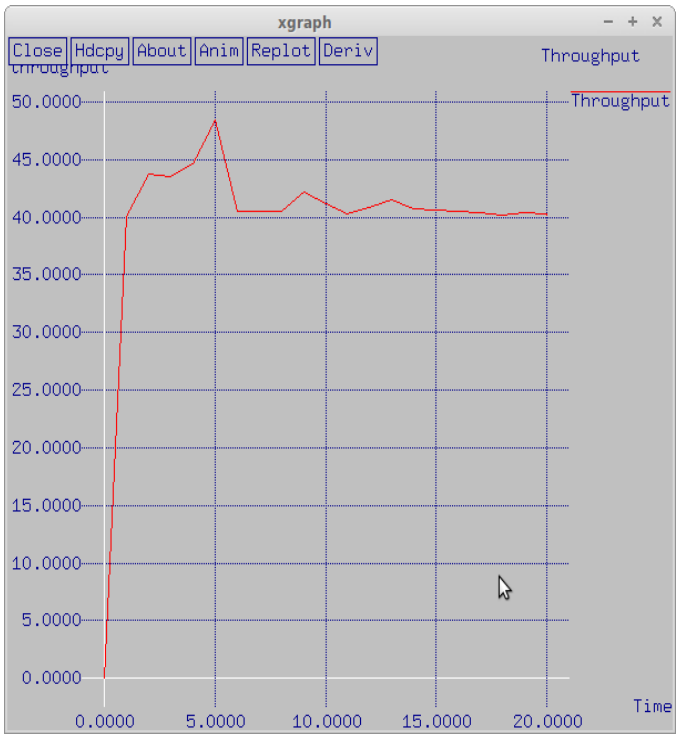

Figure 4: Throughput

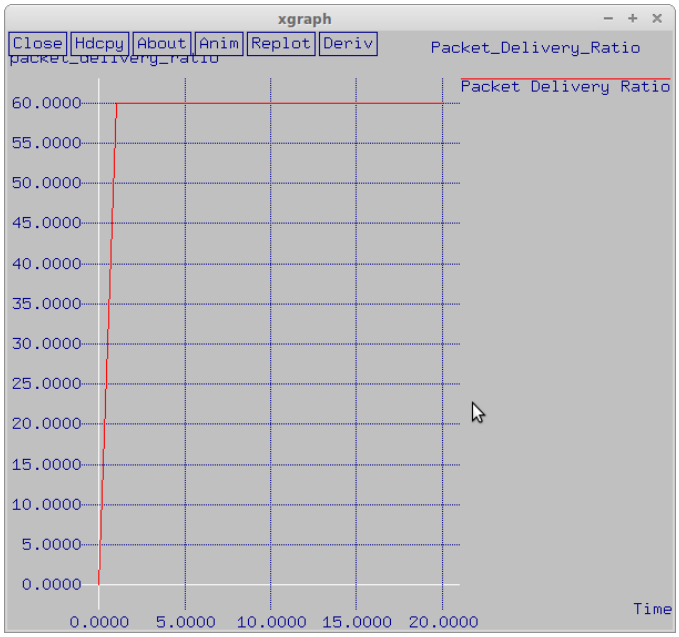

Figure 5: Packet Delivery Ratio

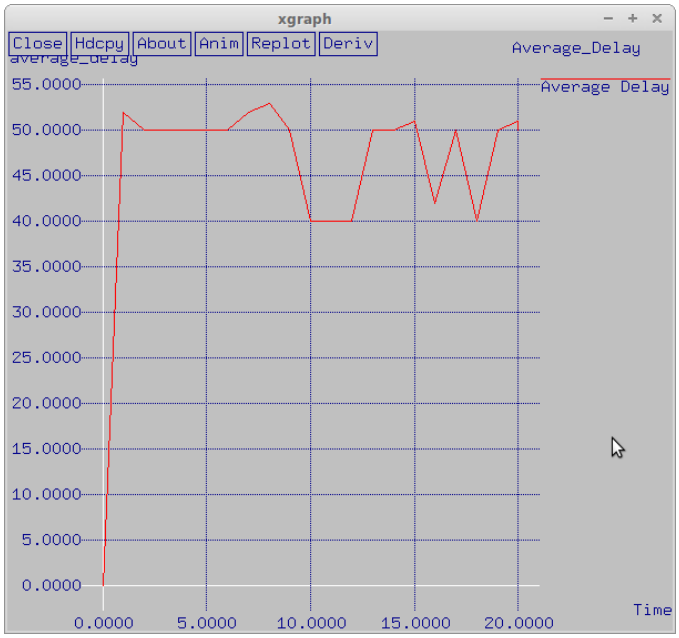

Figure 6: Average Delay

CONCLUSIONS

In our work, we used an effective proposed scheme, Balanced and Energy Efficient Multipath Routing with Robust Transmission in MANET to overcome limitations in mobile ad hoc networks. A set of multiple paths are established from source to multicast destinations using energy efficient neighbor node selection mechanism. It provides effective load balancing at the node and finds a stable path between the source and destination meeting the delay requirement.

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