ENERGY EFFICIENT MULTIPATH ROUTING PROTOCOLS FOR MOBILE ADHOC NETWORK USING THE FITNESS FUNCTIONS

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Abstract: Mobile ad hoc network (MANET) is a collection of wireless mobile nodes that dynamically form a temporary network without the reliance of any infrastructure or central administration. Energy consumption is considered as one of the major limitations in MANET, as the mobile nodes do not possess permanent power supply and have to rely on batteries, thus reducing network lifetime as batteries get exhausted very quickly as nodes move and change their positions rapidly across MANET. This paper highlights the energy consumption in MANET by applying the fitness function technique to optimize the energy consumption in ad hoc on demand multipath distance vector (FF-AOMDV) routing protocol. The proposed protocol is called FF-AOMDV with the fitness function (FF-FF-AOMDV).

Keywords: Mobile ad hoc network, fitness function, Internet Protocol

1. INTRODUCTION

Mobile Computing describes the application of small, portable, wireless computing and communication devices, which is used when mobile is changing its location. It requires wireless network to support outdoor mobility and handover from one network to another network. Challenges of the mobile computing are mobility context aware applications, naming and locating, routing data and messages, reliability in the presence of disconnection, data management, transaction models, security and seamless mobility.

The performance of computer and wireless communications technologies has advanced in recent years. As a result, it is expected that the use and application of advanced mobile wireless computing will be increasingly widespread. Much of this future development will involve the utilization of the Internet Protocol (IP) suite. Mobile ad hoc networks (MANETs) are envisioned to support effective and robust mobile wireless network operation through the incorporation of routing functionality into mobile nodes. These networks are foreseen to have topologies that are multichip, dynamic, random, and sometimes rapidly changing. These topologies will possibly be composed of wireless links that are relatively bandwidth-constrained. Ad hoc networks are crucial in the evolution of wireless networks, as they are composed of mobile nodes which communicate over wireless links without central control. The traditional wireless and mobile communication problems like bandwidth optimization, transmission quality enhancement and power control are directly inherited by ad-hoc wireless networks. Furthermore, new research problems like Configuration advertising, discovery and maintenance are also brought on by ad hoc.

In MANETs, the limited battery capacity of a mobile node affects network survivability since links are disconnected when the battery is exhausted. Therefore, a routing protocol considering the mobile nodes energy is essential to guarantee network connectivity and prolong the network lifetime. Power-aware routing protocols deal with the techniques that reduce the energy consumption of the batteries of the mobile nodes. This approach is basically done by forwarding the traffic through nodes that their batteries have higher energy levels. This will increase the network lifetime.

Various power-aware routing protocols have been proposed by taking into account the energy consumption for the transmission or the remaining battery level of the mobile nodes or both. By using such power-aware routing protocols, various routing costs and path selection algorithms have been investigated for the purpose of improving the energy efficiency in the MANET. Many routing protocols have been developed during the last years to increase the lifetime of a route and in turn the lifetime of the network. One of these developments is multipath routing protocols. Multipath routing protocols enable the source node to choose the best route among many routes during a single route discovery process. This process in multipath routing will decrease the number of route discovery processes since there are backup routes already available and in case one route fails will reduce the end-to-end delay, energy consumption and the network lifetime.

II. RELATED WORK

This study presents an energy efficient multipath routing protocol called ad-hoc on demand multipath distance victor with the fitness function (FF-FF-AOMDV). The FF-FF-AOMDV uses the fitness function as an optimization method, in this optimization, we seek for two parameters in order to select the optimum route on of them is energy level of the route and the another one is the route distance in order to transfer the data to the destination more efficiently by consuming less energy and prolonging the network lifetime.

Based on the results of the simulation, the FF-FF-AOMDV routing protocol outperformed both ad-hoc on demand multipath distance victor (FF-AOMDV) and ad-hoc on demand multipath routing with life maximization (AOMR-LM) routing protocols in terms of throughput, packet delivery ratio, end-to-end delay, energy consumption, network lifetime and routing overhead ratio except the AOMR-LM when comparing with energy consumption and network lifetime where it has better performance than FF-FF-AOMDV with these two metrics.

III. PROBLEM STATEMENT

3.1 EXITING MODEL

Sun et al. proposed an Energy-entropy Multipath Routing optimization algorithm in MANET based on GA (EMRGA). The key idea of the protocol was to find the minimal node residual energy of each route in the process of selecting a path by descending node residual energy. It can balance individual nodes battery power utilization and hence prolong the entire networks lifetime and energy variance.

Rajaram & Sugesh addressed the issues of energy consumption and path distance from the source to the destination in MANET. They proposed a multipath routing protocol based on AOMDV called as, Power Aware Ad-hoc On Demand Multipath Distance Vector (PAAOMDV). The proposed protocol updates the routing table with the corresponding energy of the mobile nodes. As this was a multipath protocol, it shifts the route without further overhead, delay and loss of packets. The simulation results showed that PAAOMDV performs well compared to AOMDV routing protocol after introducing energy-related fields in PAAOMDV

DISADVANTAGES OF EXISTING SYSTEM:

- Less Packet delivery ratio
- Low Throughput
- High End-to-end-delay
- More Energy consumption and Less Network lifetime.

3.2 PROPOSED SYSTEM:

- We proposed a new multipath routing protocol called the FF-AOMDV routing protocol, which is a combination of Fitness Function and the AOMDV's protocol. In a normal scenario, when a RREQ is broadcasted by a source node, more than one route to the destination will be found and the data packets will be forwarded through these routes without knowing the routes' quality.
- By implementing the proposed algorithm on the same scenario, the route selection will be totally different. When a RREQ is broadcast and received, the source node will have three (3) types of information in order to find the shortest and optimized route path with minimized energy consumption.

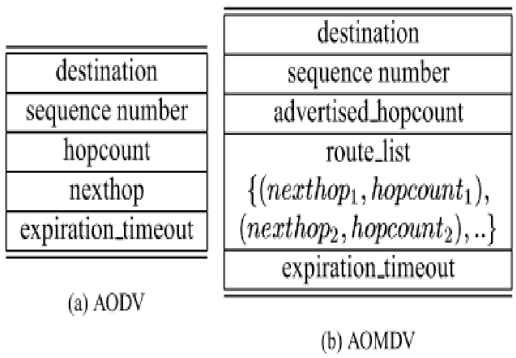
ADVANTAGES OF PROPOSED SYSTEM:

- Ease Throughput.
- Low End-to-end-delay
- Less Energy consumption and More Network lifetime

IV.OVERVIEW

FF-AOMDV Routing Protocol

An on-demand routing protocol, FF-AOMDV has its roots in the ad hoc on-demand distance vector (AODV), a popular single-path routing protocol. FF-AOMDV creates a more extensive AODV by discovering, at every route discovery process, a multipath (i.e. several other paths) between the source and the destination. The multipath has a guarantee for being loop-free and link-disjoint. FF-AOMDV likewise offers two key services: route discovery and route maintenance. Since it greatly depends on the AODV route information, which is already available, FF-AOMDV incurs less overhead than AODV through the discovery of multiple routes. Compared to AODV, FF-AOMDV's only additional overhead is extra route requests (RREPs) and route errors (RERRs) intended for multipath discovery and maintenance, along with several extra fields to route control packets (i.e. RREQs, RERRs and route replies (RREPs)). Adding some fields and changing others modified the structure of the FF-AOMDV's routing table. Figure 1 presents the routing table entries' structure for AODV and FF-AOMDV. In FF-AOMDV, *advertised hopcount* is used instead of the *hopcount* in AODV. A *route_list* stood as a replacement for *nexthop;* this change essentially defining multiple *nexthops* with respective *hopcounts*. All *nexthops*, however, are still allotted the same destination sequence number. Every time the *sequence number* gets updated, the advertised hopcount is initialized.



Routing table structure. (a) AODV, (b) AOMDV.

After performing the simulations using NS-2, the overall performance comparison between FF-AOMDV-AODV shows that the former algorithm was able to cope up with route failures more effectively that are mobility-induced. Particularly, FF-AOMDV decreases the packet loss to 40%

and greatly improves the end-to-end delay. It also causes a reduction of routing overhead to about 30% by decreasing route discovery operations' frequency hence improving the overall performance of MANET compare to AODV algorithm.

Route Discovery And Maintenance

Route discovery and route maintenance involve finding multiple routes from a source to a destination node. Multipath routing protocols can try to discover the link-disjoint, node disjoint, or non-disjoint routes. While link-disjoint routes have no common links, it may have nodes in common. Node-disjoint routes, which are also referred to as totally disjoint routes, do not have common nodes or links. Non-disjoint routes, on the other hand, can have both nodes and links that are in common. FF-AOMDV's primary idea is in discovering multiple routes during the process of route discovery. The design of FF-AOMDV is intended to serve highly dynamic ad-hoc networks that have frequent occurrences of link failure and route breaks. A new process of route discovery is necessary in the event that all paths to the destination break.FF-AOMDV utilizes three control packets: the RREQ; the RREP; and the RERR. Initially, when a source node is required to transmit data packets to a specific destination, the source node broadcasts a RREQ. Because the RREQs is a flooded network-wide, several copies of the very same RREQ may be received by a node. In the FF-AOMDV, all duplicate copies undergo an examination to determine the potential alternate reverse path. However, of all the resulting set of paths to the source, only the use of those copies, which preserve loop-freedom and disjointedness, get to form the reverse paths. In the event the intermediate nodes get a reverse path through a RREQ copy, it conducts a check to determine the number of valid forward paths (i.e. one or many) to the destination. If so, a RREP is generated by the node and the request is sent back to the source using the reverse path. Since this route discovery, the RREP has a forward path that was not employed in any prior RREPs. The RREQ is not further propagated by the intermediate node. Otherwise, the node would broadcast the RREQ copy again in case any other copy of this RREQ has not been previously forwarded and this copy has led to the updating or the formation of a reverse path.

V. SAMPLE SCREEN SHOTS

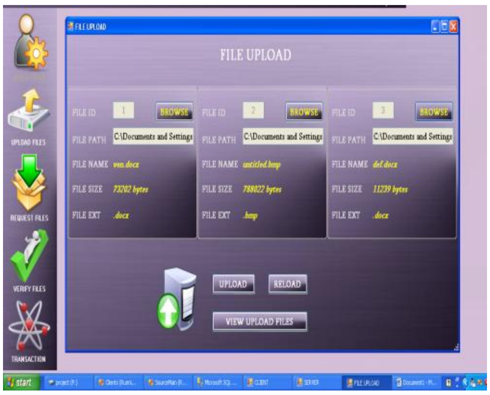


Figure 5.6 Server File Upload

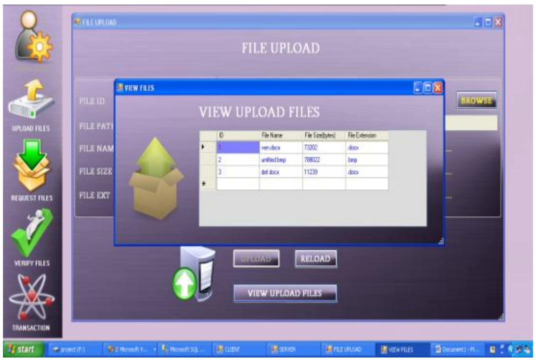


Figure 5.7 View Upload Files

Figure 5.10 File Request

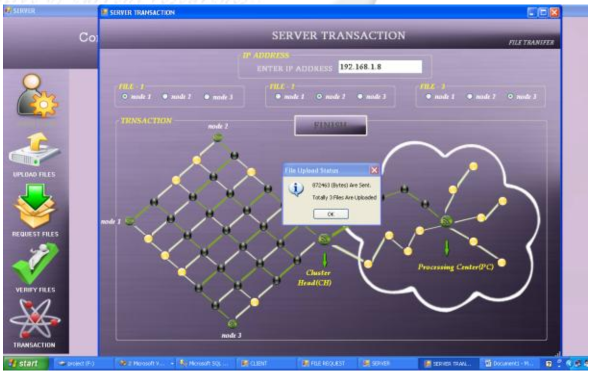


Figure 5.15 Server Transaction File Upload details

VI. CONCLUSION

In this research, we proposed a new energy efficient multi-path routing algorithm called FF-AOMDV simulated using NS-2 under three different scenarios, varying node speed, packet size and simulation time. These scenarios were tested by five (5) performance metrics (Packet delivery ratio, Throughput, End-to-end-delay, Energy consumption and Network lifetime). Simulation results showed that the proposed FF-AOMDV algorithm has performed much better than both AOMR-LM and AOMDV in throughput, packet delivery ratio and end-to-end delay. It also performed well against AOMDV for conserving more energy and better network lifetime.

FUTURE ENHANCEMENT

As a future work, there are several scenarios that could be implemented with this study to enhance the energy consumption and network lifetime. For instance, it is possible to consider another network resource which is the bandwidth as another fitness value. In this case the calculations for selecting routes towards the destination will be according to energy, distance and bandwidth. Basically this will consider many network resources which will prolong the network lifetime and enhances the QoS.

VII. REFERENCE

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