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Reducing Routing Overhead Using Neighbor Coverage Based Probabilistic Rebroadcast with Multipath Routing

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Abstract

A Mobile Ad hoc Network (MANET) is a personality classifies wireless networks for mobile strategy. Mobile Ad hoc Networks also as called auto organize arrangement, in which mobile strategy are emotionally involved as a wireless node. An Ad hoc network is a collection of wireless mobile nodes which dynamically forming a temporary mobile nodes which dynamically forming a temporary network without the aid of any established infrastructure or centralized administration. AODV main drawback is deliver the packets in single path so it takes more time to reinitialize packet because of data loss. To overcome from this problem proposed method of Modified AOMDV is introduces to deliver the packets in multiple path. Experimental result shows the performance of packet delivery, energy consumption and delay rate for proposed method.

Keywords: Mobile Ad hoc Network, Neighbor Knowledge Probabilistic Rebroadcast, Ad hoc On-demand Multi path Distance Vector, Modified Ad hoc On-demand Multi path Distance Vector.

Introduction

MANET is an autonomous collection of mobile users that communicate over relatively bandwidth constrained wireless links. Since the nodes are mobile, the network topology may change rapidly and unpredictably over time. The network is decentralized, where all network activity including discovering the topology and delivering messages must be executed by the nodes themselves, i.e., routing functionality will be incorporated into mobile nodes.

MANET stands for "Mobile Ad hoc Network." A MANET is a type of ad hoc network that can change locations and configure itself on the fly. Because MANETS are mobile, they use wireless connections to connect to various networks. This can be a standard Wi-Fi connection, or another medium, such as a cellular or satellite transmission. Some MANETs are restricted to a local area of wireless devices (such as a group of laptop computers), while others may be connected to the Internet.

For example, A VANET (Vehicular Ad hoc Network) is a type of MANET that allows vehicles to communicate with roadside equipment. While the vehicles may not have a direct Internet connection, the wireless roadside equipment may be connected to the Internet, allowing data from the vehicles to be sent over the Internet. The vehicle data may be used to measure traffic conditions or keep track of trucking fleets. Because of the dynamic nature of MANETs, they are typically not very secure, so it is important to be cautious what data is sent over a MANET.

The remainder of this is organized as follows. Section 2 summarizes the concepts and literature survey. Section 3 discusses the proposed method and section 4 provides the experiments with high accuracy. Finally, Section 5 presents the conclusions of the work.

Literature survey

The MANETs are very vulnerable to various attacks from malicious nodes. In order to reduce the hazards from such nodes and enhance the security of network, this paper presents a dynamic trust prediction model to evaluate the trustworthiness of nodes, which is based on the nodes' historical behaviors, as well as the future behaviors via extended fuzzy logic rules prediction are given by Xia et al [2]. This paper is presented by Lee et al [1], they present a novel content management approach, called LACMA that leverages the location information available to mobile devices via GPS. The main insight behind LACMA is to bind data to geographic location.

A growing number of ad hoc networking protocols and location-aware services require that mobile nodes

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learn the position of their neighbors. In this paper, we address this open issue by proposing a fully distributed co-operative solution that is robust against independent and colluding adversaries, and can be impaired only by an overwhelming presence of adversaries shown by Fiore et al [3]. Link failure in Mobile Ad hoc Networks (MANETs) often causes dropping of data packets and thus affects the network performance significantly. In this paper, they propose an end-to-end Stable Route Development and Repairing mechanism called SRDR, exploiting the lifetime of the concerned links and residual energy of the mobile nodes. Thus, our proposed mechanism provides high performance and low routing overhead and low end-to-end delay are given by Islam et al [4].

MANET routing protocol performance mostly depends on the various network conditions. The basic parameters can be consider that have an impact on the routing protocol are mobility, traffic, shared medium and Received Signal Strength (RSS). A route was discovered before sending a packet to the destination given by Yovraj et al [5].

Bagwari et al [6] shows ease of deployment and the infrastructure less nature of Mobile Ad hoc Networks (MANETs) make them highly desirable for the present day multimedia communications. Traditional routing protocols may not suffice for real time communications it depends upon the conditions and our requirements.

Kumar et al [7], first one is a novel energy based routing algorithm to reduce the link breaks in mobile ad hoc networks and second analysis of network performance under different traffic conditions. This present approach reduces packet loss and finds optimized route by taking into consideration of bandwidth, delay which results by improvement of quality of service. Wireless Sensor Networks (WSNs) have attracted much attention in recent years. The potential applications of WSNs are immense. The architecture of a WSN system comprises of a set of sensor nodes and a base station that communicate with each other and gather local information to make global decisions about the physical environment is given by Keshtgari et al [8].

Wireless-sensor-network-based home monitoring system for elderly activity behavior involves functional assessment of daily activities. The developed system for monitoring and evaluation of essential daily activities was tested at the homes of four different elderly persons living alone and the results are encouraging in determining wellness of the elderly show by Suryadevara et al [9]. With the development of Ad Hoc networks, the demand of QoS becomes more and more than ever before, it is more important to provide QoS guarantee for multimedia application. Routing mechanism is described in detail and node disjoint path algorithm is a key. This paper provides a good idea to study further QoS routing protocol by Zheng et al [10].

Qabajeh et al [11], essential problem in mobile ad hoc networks is finding an efficient and secure route from a source to an intended destination. In this paper, they have proposed a new model of routing protocol named ARANz, which is an extension of the original Authenticated Routing for Ad Hoc Networks (ARAN). Sagar et al [12], presents a framework for experimental parameters in which Packet Delivery Ratio (PDR), effect of link duration over End-to-End Delay (E2ED) and Normalized Routing Overhead (NRO) in terms of control packets is analyzed and modeled for Mobile Ad hoc Networks (MANETs) and Vehicular Ad hoc Networks (VANETs) with the assumption that nodes (vehicles) are sparsely moving in two different road.

Mobile Ad hoc Networks (MANETs) are self-configuring networks of mobile nodes, which communicate through wireless links. The main issues in MANETs include the mobility of the network nodes, the scarcity of computational, bandwidth and energy resources shown by Macone et al [13]. Sharma et al [14], shows the mobility of nodes results in frequent and unpredictable changes of network topology, leads to regular route changes, network partitions and possibly packet losses, making routing a challenging task in MANET network.

Clustering can help aggregate the topology information and reduce the size of routing tables in a Mobile Ad hoc Network (MANET). Therefore, in a MANET, an effective clustering algorithm should efficiently adapt to each topology change and produce the new load balanced cluster head set quickly by Cheng et al [15].

Proposed methodology

MANET (Mobile Ad hoc Network) is a wireless network whose nature is self configuring and organizing network without any base station. This research evaluates the performance of various ad hoc routing protocols AODV, AOMDV and modified AOMDV in terms of energy efficiency and it also proposes a new routing algorithm that modifies

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AOMDV and it provides better performance compared to all the above protocols.

a. NCPR (NEIGHBOR KNOWLEDGE PROBABILISTIC REBROADCAST PROTOCOL)

NCPR (Neighbor Knowledge Probabilistic Rebroadcast Protocol) calculate the rebroadcast delay and rebroadcast probability of this protocol. This work use the upstream coverage ratio of an RREQ packet received from the previous node to calculate the rebroadcast delay, and use the additional coverage ratio of the RREQ packet and the connectivity factor to calculate the rebroadcast probability in our protocol, which requires that each node needs its 1-hop neighborhood information. NCPR is performed based on the neighbor knowledge method. The main advantage of this method is increase in packet delivery ratio, decrease in the average end -to -end delay transmissions, reduce frequent link breakages and path failures, routing and mobility management should be maintained.

b. AOMDV

Ad hoc On-demand Multipath Distance Vector Routing protocol is an extension to the AODV protocol for computing multiple loop-free and link disjoint paths. The routing entries for each destination contain a list of the next-hops along with the corresponding hop counts. All the next hops have the same sequence number. This helps in keeping track of a route. For each destination, a node maintains the advertised hop count, which is defined as the maximum hop count for all the paths, which is used for sending route advertisements of the destination. Each duplicate route advertisement received by a node defines an alternate path to the destination. Loop freedom is assured for a node by accepting alternate paths to destination if it has a less hop count than the advertised hop count for that destination. Because the maximum hop count is used, the advertised hop count therefore does not change for the same sequence number. When a route advertisement is received for a destination with a greater sequence number, the next-hop list and the advertised hop count are reinitialized.

c. MODIFIED AOMDV (MAOMDV)

The main idea in Modified AOMDV is to compute multiple paths during route discovery. It is designed primarily for highly dynamic ad hoc networks where link failures and route breaks occur frequently. When single path on-demand routing protocol such as AODV is used in such networks, a new route discovery is needed in response to every route break. Each route discovery is associated with high overhead and latency. This inefficiency can be avoided by having multiple redundant paths available. Now, a new route discovery is needed only when all paths to the destination break.

A noteworthy feature of the Modified AOMDV protocol is the use of routing information already available in the underlying AODV protocol as much as possible. Thus little additional overhead is required for the computation of multiple paths. The Modified AOMDV protocol has two main components:

A route update rule to establish and maintain multiple loop-free paths at each node.

A distributed protocol to find the link-disjoint paths.

Algorithm for Modified AOMDV

1: **if** $\left(seq\_num_i^d < seq\_num_i^d\right)$ **then** {/* enforces the sequence number rule */}
2: $seq\_num_i^d := seq\_num_j^d$**;**
3: $advertised\_hop\_count_i^d$:=∞;
4: $route\_list_i^d := NULL$;
5: **if** (j = d)**then** {/* neighbor is the destination */}
6: insert (j, i, 1) into $route\_list_i^d$;
7: **else**
8: insert $\left(j, last\_hop_{jk}^d, advertised\_hop\_count_j^d + 1\right)$**into** $route\_list_i^d$;
9: **end if**
10: **else if** $\left(\left(seq\_num_i^d = seq\_num_j^d\right)\boldsymbol{and}\left(advertise\_hop\_count_i^d > advertise\_hop\_count_j^d\right)\right)$
Then {/* enforces the route acceptance rule */}
11: **if** (j= d)**then** {/* neighbor is the destination */}
12: **if** $((/\exists k_1: (next\_hop_{ik1}^d = j))$ **and** $(/\exists k_2: (last\_hop_{ik2}^d = i)))$ **then** {/*establishes uniqueness of next and last hops */}
13: insert (j , i, 1) into $route\_list_i^d$;
14: **end if**
15: **else if** $((/\exists k_3: (next\_hop_{ik3}^d = j))$ **and** $(/\exists k_4: (last\_hop_{ik4}^d = last\_hop_{jk}^d)))$ **then** {/*establishes uniqueness of next and last hops */}
16: insert $j, last\_hop_{jk}^d, advertise\_hop\_count_j^d + 1$ into $route\_list_i^d$;
17: **end if**
18: **end if**

Modified AOMDV route update rules. A node I invoke these rules whenever it receives a route advertisement for a destination d from a neighbor j. the variable $seq\_num_i^d$, $advertise\_hop\_count_i^d$ and

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$route\_list_i^d$ represent the sequence number, the advertised hop count and the list of routes, respectively, for destination d at node $i (i \neq d)$. The variables $next\_hop_{ik}^d$ and $last\_hop_{ik}^d$ represent the next and last hops of kth path in the routing table entry for d at i, that is, $next\_hop_{ik}^d, last\_hop_{ik}^d, hop\_count_{ik}^d \in route\_list_{ik}^d$.

Experimental results

In the present chapter, the proposed approach for mobile ad hoc care evaluated. The performances of the algorithms have been evaluated using the various parameters. The proposed algorithms are simulated using Network Simulator-2 (NS2). The obtained simulation results are compared and evaluated based on the performance of AODV with Modified AOMDV routing protocols. In highly dynamic environment like MANET, small region size may result in rapid variances of the structure of the key tree. On the other hand, if the size is too large, it may have problems in intra-region routing. Current on-demand routing protocols, such as AODV and Modified AOMDV, handle well when the size of MANET is around 100–250 nodes.

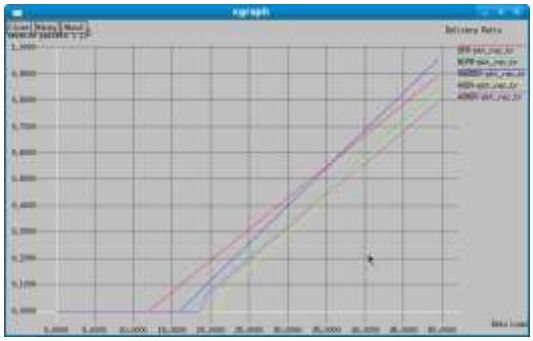

Figure 1: Delivery Ratio

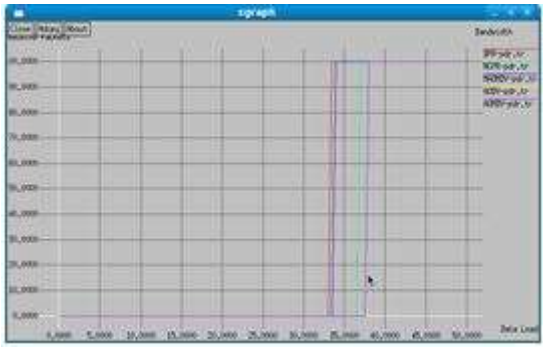

Figure 2: Bandwidth

The figure 1 and figure 2 shows the delivery ratio and bandwidth for the protocols. The proposed method of Modified AOMDV has high packet delivery and bandwidth when compare with others.

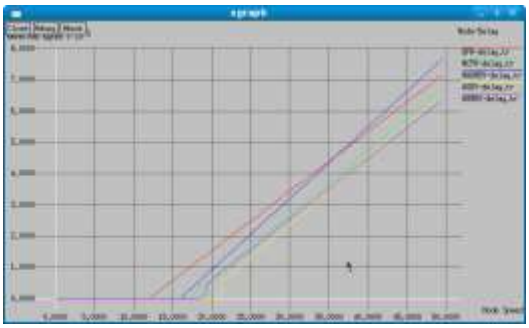

Figure 3: Delay

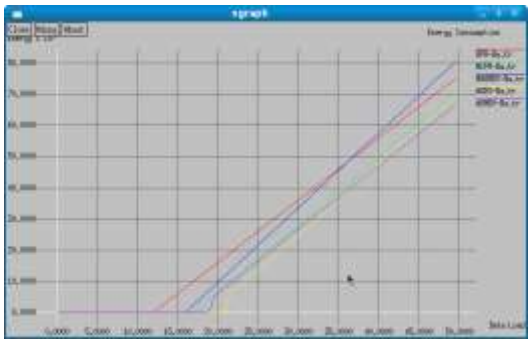

Figure 4: Energy Conception

Figure 3 and figure 4 show the delay and energy for the protocols. The proposed method has less delay rate with less energy conception.

Conclusion

In this research, the performance of the different routing protocol in MANET is evaluated. Here NCPR is compared with AODV and Modified AOMDV. Modified AOMDV's main concept is to detect the nodal outstanding energy of each route in the process of selecting path, which wills the select the path having least minimum nodal residual energy. The proposed Modified AOMDV reduces average delay for transmitting and reduces packet loss ratio. It uses a simple multipath routing protocol, it dynamically adapts to varying network topology and it uses strength to select best path. The performance of the Modified AOMDV is compared with NCPR and AOMDV which gives better performance and shown in experimental result.

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